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OUR ISLE OF SAFETY
WHILE MOSCOW LAUGHS
THE DIFFICULTY

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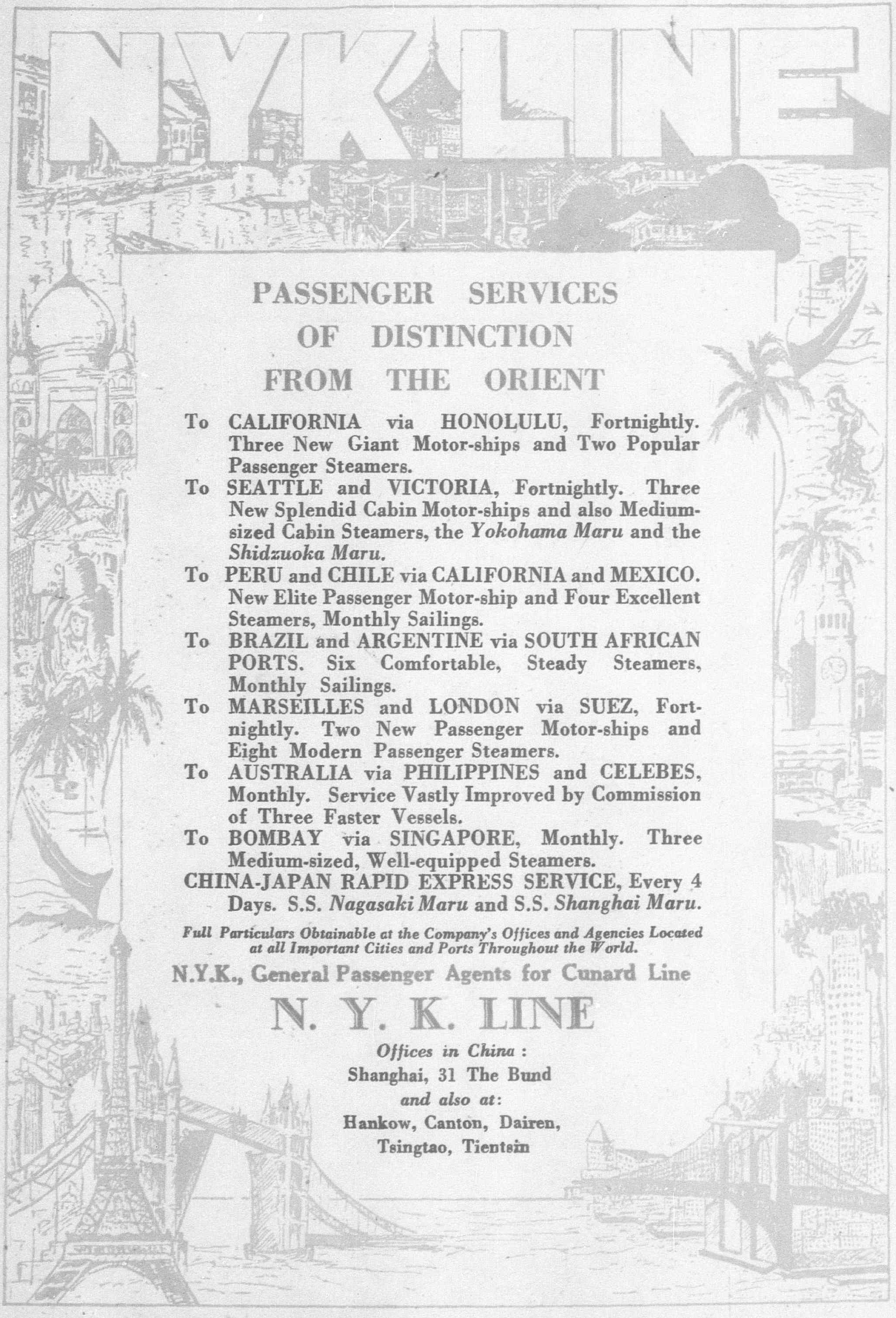

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American Advice from a Great American

From Hearst's "San Francisco Examiner," February 4, 1932

In the war crisis in China there are possibilities of much trouble for the United States and of no advantage.

Yet there is no need whatever for American participation in the Chino-Japanese conflict.

As long as we can protect our nationals at Shanghai and elsewhere in China **without involving the United States in the warfare between Japan and China,** we owe it to ourselves as a Nation to provide such protection.

When we can no longer protect our nationals on the mainland of Asia without being dragged into the warfare between Japan and China, we should evacuate our nationals to Manila and organize for their protection there until it is safe for them to return to China.

Under no circumstances should the United States permit European powers to use the open door policy, the Kellogg pact, the League of Nations covenant, or any other excuse camouflaging their own interests, **to involve this country in the conflict between Japan and China.**

It is true that the United States enunciated the open door policy more than thirty years ago in an effort to discourage the partition of China, foster peace in the Far East, and keep open the channels of trade for ourselves and other nations.

But President Roosevelt, a man of far greater wisdom and far better Americanism than the present President, spoke powerfully and truthfully for the American people when he declared that they would never go to war to enforce the open door policy in the Far East.

As President, Roosevelt acted upon this assumption in his conduct of our foreign relations; and after he left the White House, he urged his successor there to do likewise.

Writing to President Taft on December 22, 1910, Roosevelt said:

"Our vital interest is to keep the Japanese out of our country and at the same time to preserve the good will of Japan. The vital interest of the Japanese, on the other hand, is in Manchuria and Korea.

"It is therefore peculiarly our interest not to take any steps as regards Manchuria which will give the Japanese cause to feel, with or without reason, that we are hostile to them, or a menace—in however slight a degree—to their interests. . . . . I do not believe in our taking any position anywhere unless we can make good; and as regards Manchuria, if the Japanese choose to follow a course of conduct to which we are adverse, we can not stop it unless we are prepared to go to war; and a successful war about Manchuria would require a fleet as good as that of England, plus an army as good as that of Germany.

"The open door policy in China was an excellent thing, and I hope it will be a good thing in the future, so far as it can be maintained by general diplomatic agreement; but, as has been proved by the whole history of Manchuria, alike under Russia and Japan, the open door policy, as a matter of fact, completely disappears as soon as a powerful nation determines to disregard it, and is willing to run the risk of war rather than forego its intention."

This was wise and statesmanlike advice from a great American to the Government at Washington when Roosevelt gave it.

It is much needed advice to the Government we have at Washington to-day.

How Wars are Fomented

On January 18, 1915, Japan presented Twenty One Demands to the President of China. Group Two concerned the extension of the Liaotung Lease and the term of the South Manchuria and the Antung-Mukden Railways to a further period of ninety-nine years. It also provided for the right of Japanese subjects to own and lease land, erect buildings thereon, liberty of residence and travel and right to engage in business, industry and commerce in South Manchuria and Inner Eastern Mongolia. It addition, it called for the recognition of certain mining rights and various railway privileges.

This, in reality, was all that Japan hoped to get out of the whole series of demands, but true to Asiatic traditions, asked for ten times more than she expected. There was no sustained opposition on the part of the Chinese Government to conceding the demands covered by Group II and these were substantially complied with after a few conferences. China also gave way on the demands over Shantung but rejected the rest.

Before accepting the demands agreed upon, the Chinese approached the Japanese and confided that an ultimatum would expedite the conclusion of the treaty and give the Chinese Government a plausible excuse for signing it. As usual, the Chinese outfoxed the Japanese and placed them in a vulnerable position. On the accuracy of this statement now hinges the Chinese case that the Treaty of May 15 covering the demands of Group II was extracted under duress. Viscount Kato, the Japanese Foreign Minister at the time the treaty was negotiated, is authority for the statement that the ultimatum was privately requested by the Chinese to "save their face." Marquis Okuma, Japan's Prime Minister at the time, made a similar statement before his death. Other Japanese diplomatic officials then on duty at the Legation in Peking, support this testimony. Dr. Sun Yat-sen also confirmed the Japanese version of the ultimatum in private talks with American newspaper correspondents.

The Chinese Government, however, sticks to the official record and insists that the ultimatum destroys the legality of the treaty and therefore it will never recognize it. Hardly had the ink dried on the treaty, when the Chinese Government on June 25, 1915, issued a Presidential Decree making it a treasonable offense for any Chinese to injure the rights of the country by entering into a contract with foreigners. In subsequent years, when the program to oust Japan from Manchuria became an obsession, many special laws and regulations were drawn up and enforced by the various Manchurian authorities, prohibiting the sale or lease of lands or houses to Japanese subjects, thus precipitating the many incidents in which Koreans were deprived of their leases after having reclaimed the land and improved the properties. The enforcement of these laws led to the Wanpaoshan affair, the frenzied retaliiaton of the Koreans and the rapid intensification of the whole dispute to the inevitable crisis.

Relying on the promise of the American Minister in Peking that the United States would support her claims at the Paris Peace Conference, China placed her fight in the hands of the American Delegation. Had it not been that Great Britain, France and Italy had secretly agreed to support Japan's acquisitions as part compensation for her participation in the war, China undoubtedly would have won her case at Paris. Disappointed and bitterly resentful over her defeat, China refused to sign the Versailles Treaty and dispatched a rabid anti-Japanese agitator to Washington to break the treaty in the Senate and stir up American resentment against Japan. The Senate's rejection of the Treaty and refusal to join the League, while based on purely domestic politics, was undeniably influenced and strengthened by the propaganda over Shantung. China cannot escape her share of the responsibility for crippling the League at its birth. China then signed the Treaty of Trianon and automatically became a member of the League.

At the Washington Conference, China again made a determined effort to bring Japan to the bar of justice over the 1915 Treaty but was defeated by the fact that Japan accepted the invitation to attend the conference on the express condition that her rights in Manchuria should not be included in the agenda. China made a dignified yet desperate assault upon the 1915 Treaty compelling the Japanese delegate, Baron Shidehara, to place on record Japan's position in the following words:

> . . . "if it should once be recognized that rights solemnly granted by treaty may be revoked at any time on the ground that they were conceded against the spontaneous will of the grantor, an exceedingly dangerous precedent would be established with far-reaching consequences upon the stability of existing international relations in Asia, in Europe and everywhere."

China's Delegate, Dr. Wang, answering Baron Shidehara, placed on record the following ominous statement;

> "The Chinese Delegation has the honor to say that a still more dangerous precedent will be established with consequences upon the stability of international relations which cannot be estimated, if, without rebuke or protest from other Powers, one nation can obtain from a friendly, but, in a military sense, weaker neighbor, and under circumstances such as attended the negotiations and signing of the treaties of 1915, valuable concessions which were not in satisfaction of pending controversies and for which no *quid pro quo* was offered."

When her efforts to have the Manchurian issue settled by the Conference failed, China reserved the right to seek a solution on all future appropriate occasions. When the original 25 year lease to Port Arthur and Dalny expired in 1923, adhering to her declared intention to ignore the 1915 Treaty as illegal, China formally notified Japan of the termination of the lease and requested the restoration of her sovereignty over the territory. Japan refused to discuss the matter.

From 1923, no further steps were taken to enforce the Chinese viewpoint until Marshal Chang Tso-lin was killed. His son and successor, allying himself with the Kuomintang and the rights recovery movement of the Nationalist Government carried out through the evasion, repudiation and abrogation of treaties and agreements, started a campaign that had for its object the slow strangulation of Japan's industries and enterprises in Manchuria by unfair competition, economic pressure, ignoring of agreements, crushing taxation and other methods designed to bring financial ruin to the South Manchuria Railway and its subsidiary enterprises. Declaring war upon Japan within the peace pacts, China was rapidly making her position untenable or at least unprofitable. This was the situation on September 18, when the Japanese army, either intentionally or in self-defense, struck to defend its rights.

This may have no bearing upon what followed, but it is well to bear in mind the basic Chinese diplomacy and declared intentions towards utilizing every appropriate occasion to find a solution to her dispute with Japan over the 1915 Treaty. It is a semi-secret that at the London Naval Conference, the United States and Great Britain assured Japan of a free hand in Manchuria in exchange for a reduction of her fleet, thus destroying China's last hope of international support in her long drawn out fight to invalidate the 1915 Treaty. This return to the secret processes of old-fashioned diplomacy convinced the Chinese that their case against Japan was lost unless a situation was created that would compel international action before it was too late to save themselves. The ground for this action was prepared by China's election to a seat on the League Council and, it is significant that the attempt to destroy the South Manchuria Railway on the night of September 18 synchronized exactly with the opening session of the Council. Had adjournment over the week-end not taken place, the Council would have been confronted on Saturday morning with the Mukden incident and China's demand for intervention. How otherwise can the Chinese explain the alleged orders of Marshal Chang Hsueh-liang commanding his armies to lay down their arms in the event of being attacked by the Japanese? It is inconceivable that any ruler would surrender his capital, his arsenal, his air-fleet, his treasury and his yamen without a fight, unless assured he would receive prompt assistance from the outside. The only error in calculation was the week-end adjournment and the rapidity of the Japanese defense. Within forty-eight hours the little Japanese army was in complete control of the strategic centers of Manchuria and Marshal Chang's power was broken. When the League Council met on Monday, it faced the accomplished fact, with a hysterical Chinese Member shrieking for immediate application of sanctions against Japan.

China threw herself unreservedly into the arms of the League and demanded intervention, with the full knowledge that any international action would ultimately lead to a consideration of the 1915 Treaty. Japan was willing to accept the League's terms in all but one point, insisting upon China's promise to comply with the treaties as a basic condition to withdrawing into the railway zone. This was the one point that China would not accept. Anything, rather than face Japan alone over the validity of the Manchurian treaties. China stubbornly refuses to negotiate this matter with Japan unless supported by international observers, while Japan just as resolutely rejects any outside intervention in a dispute she considers as one that concerns only herself and China. In other words, the situation is an exact duplicate of the one created at the Washington Conference, only in this instance China threw her case into the League, her last and only hope for international intervention to compel Japan to get out of Manchuria.

With a full understanding that if the League accepts the adjudication of a dispute having its origin in the validity of a treaty extracted under duress it would kill its own usefulness, China insisted that the League dig its own grave. When the real facts of the situation filtered through to Geneva and the League began to understand what it all meant it began to back away from the precipice that yawned before it. The failure of the League to stop Japan caused China's enthusiasm for this body rapidly to wane.

Right here, it is necessary to revert to the statement made by Dr. Wang at the Washington Conference and emphasize its significance. He said, in effect, that China is not concerned with the stability of existing international relations elsewhere in the world, and unless the League and the Powers stand with her against Japan over the validity of the 1915 Treaty, a **"still more dangerous precedent will be established with consequences upon the stability of international relations which cannot be estimated."** In plain words, China will tear the whole world apart and drag other nations down to ruin before she will confront Japan alone and accept the treaty of 1915 as binding.

Compare the above declared policy of China with the following statement given to the press at Nanking on October 6, by Dr. W. W. Yen, on his appointment as Chinese Minister to Washington.

> "China is at the cross roads," he said. "One means following instinctively the rule of law and reason in international affairs. The other leads to the adoption of extremist ideas and measures which have little regard for the consequences. This road will be followed in disappointment and desperation. The decision and responsibility for the decision as to what road China will follow rests largely upon the attitude and actions of nations whose ideals and interests are seriously menaced by the militaristic violations of agreements designed to maintain peace."

Dr. W. W. Yen is a Northern politician affiliated with the Chang Hsueh-liang faction. Before commenting further on the above statement, it is well to ponder over the following extract from an editorial in *The Peking Leader* of September 24. This newspaper is, or rather was, the organ of the Chang Hsueh-liang Government.

> "The Signatories of the Kellogg Peace Pact are indifferent because war has not been created by Japan's unwarranted invasion of Chinese territory. Public sentiment is being worked up and sooner or later, the Chinese nation, if it is going to remain one at all, will have to rise and create a rumpus to turn this international aggression into an international war—to conform to the requirements of the Kellogg Pact."

The Peking Leader, (since suppressed as the result of pressure from the Japanese Legation at Peking) interprets the more diplomatic utterances of Dr. Wang and Dr. Yen in understandable English. There never has been any doubt as to the certainty that China would create some incident that would involve other nations in her quarrel with Japan in order to force international action, once the Chinese became convinced that the League or the United States would not intervene to stop Japan. The only uncertainty was how, when, and where the incident would occur. For a time, it looked as though Tientsin might furnish the excuse, but that incident fizzled out owing to an old treaty provision prohibiting the approach of Chinese armies to within a specified distance of the port. Had it not been for this, the issue would have been created in the Northern port. Since then, it has become more and more evident that the League would not intervene further than to send a Commission of Inquiry to Manchuria, while all appeals to the United States to invoke the Kellogg and Nine Power Pacts have failed to bring the required results. Facing the loss of Manchuria and with all hope of foreign intervention gone, China had either to accept defeat and face Japan alone, or kick up such a rumpus as would **"turn this international aggression into an international war"** and force the application of the Peace Pacts and Article XVI of the Covenant.

So we come to Shanghai and the chain of events that led up to the night of January 28. It is unprofitable to follow in detail the unfolding of the tragedy now being enacted in the environs of this port. As in Manchuria, there are as many versions of what happened as there are observers and narrators. For the purposes of this article, it is safer to adhere to the report of the League Commission as the most impartial record of what led up to the explosion and what followed. Here again, there is the same conflict of evidence as to how the fight started.

It is generally accepted that the Japanese blundered, but there is this much be said in their favor. Neither the high officials of the Government in Tokyo or the big-business men of Japan desired to further complicate a situation that called for all their tact and diplomacy to surmount with dignity. Although the situation in Shanghai was ominous and loaded with dynamite, Tokyo confidently expected that it would be handled successfully by the small naval contingent assigned to protect lives and properties in co-operation with the forces of other nations. The blow-up on the night of January 28 was entirely unexpected in Tokyo and aroused considerable criticism and resentment against Admiral Shiosawa for not being able to prevent a situation that was clearly foreseen would lead to further embarrassing and dangerous complications.

Who was to blame? The Japanese present a clear-cut case, proving that they were attacked when they moved to take up the positions assigned to them and therefore acted in self-defense. The Chinese have an equally convincing case that the Japanese invaded Chinese territory and they simply defended their position. Both statements are supported by the testimony of unimpeachible witnesses. Both sides are right. The Governments of both sides however must be guided by the official reports of their own representatives and support them, if necessary, by force. Who is to be the judge?

We come to the story of the 19th Route Army and its part in precipitating the trouble. Here again, there are as many versions of the motives which influenced these troops to make a stand against the Japanese as there are stories of what followed. The following facts however stand out from the mass of rumors and help us to understand what it is all about. The 19th Route Army is composed of three Cantonese Divisions which have rendered a good account of themselves in the many campaigns they have taken part in. These troops were transferred from their own province to the Shanghai-Nanking area as part of the agreement that brought peace between Canton and Nanking in December last. The control of the Shanghai-Nanking Railway district by this army was a pre-requisite to the Cantonese leaders coming to Nanking to participate in the Government and entrusting their safety to the promises of Generalissimo Chiang Kai-shek. This army, garrisoning the Shanghai area, constituted a guarantee that in the event of further political trouble, the Cantonese leaders would not be forcibly detained by their Ningpo military colleague. That is all. There was no patriotism or high motives in their being here, simply a cold, calculated insurance against a repetition of the Hu Han-ming outrage, the guarantee of a safe and quick get-away to the protection of Shanghai in the event of a rupture.

The break came on January 25 over the Government's policy in regard to Japan. Mr. Eugene Chen, the new Foreign Minister and one of the Cantonese leaders, proposed the immediate severance of diplomatic relations with Japan to be followed by a declaration of war. General Chiang Kai-shek, who would have to do the fighting and who knew perhaps the limitations of his army and resources, rejected these proposals as too drastic. So the split came. Mr. Chen and Mr. Sun Fo finding themselves in opposition to the big military chief and fearing the usual termination to such differences of political opinion hastily left Nanking for the safer precincts of the International Settlement. Once more, Canton and Nanking were at odds, facing another civil war, but this time a Cantonese army was entrenched outside of Shanghai commanding the approaches to the city and port.

Here we have the familiar picture of a Chinese army from another province entrenched on the soil of another warlord's preserves, holding the premier city of China and the source of all government revenues as hostage for its own safety as well as that of its political leaders. The withdrawal of this army from the vicinity of Shanghai, or its return to its home province, meant the certain end of Canton's influence at Nanking and the finish of the Kuomintang party dictatorship. The departure of this army would automatically compel the hasty exit of Mr. Eugene Chen and Mr. Sun Fo and their followers from Shanghai and terminate their careers as national political figures. The army that dominates the Shanghai area, controls the purse strings of the treasury and dictates the personnel of the government. Chiang Kai-shek, in anticipation of trouble, whether with Canton or Japan, had moved his crack divisions to Loyang and was in no position to enfore his orders to the Cantonese. Unless the 19th Route Army could be induced to evacuate the Shanghai area, his sources of revenue would be cut off and his power handed over to his political enemies. If the 19th Route Army retired from their positions around Shanghai towards Nanking or Hangchow, it was a foregone conclusion that sooner or later they would come into conflict with Chiang's divisions and be wiped out. The Canton army was therefore between the devil and the deep sea. They dared not move. There are stories to the effect that Chiang Kai-shek ordered them out but they refused to go. There are other stories that several thousand troops from Hangchow were sent to disarm them but on arrival threw in their lot with them. There are other stories, all irrelevant to the main facts. As long as the 19th Army remained entrenched around Shanghai, their political leaders were still in the ring and could dictate terms to Nanking. They held Shanghai and the army that holds this port holds the purse strings and the power of government in China. Chiang Kai-shek let himself out on the end of a limb when he allocated the Shanghai-Nanking area to the Cantonese and sent his own crack battalions to far-away Loyang. He may be the main figure in the government, but unless his army controls Shanghai, he is just one of the many war-lords out of luck.

There may be other excellent reasons to explain the resistance of the 19th Army, but after all is said, the fact remains that in the beginning, it was fighting for the only thing that makes war profitable in China and in doing so have transformed a sordid struggle for power and pelf into a patriotic war that may result in a real rebirth of the nation. In addition to these basic influences, there remains the undisputed fact that the Cantonese leaders who broke with Nanking on January 25, had declared for war with Japan. They came to Shanghai bitterly resentful of the other group which stood for peace, or, at least, for less drastic measures. Here they had their own army, ordered out by Chiang but with no place to go with any chance of escape from Chiang's divisions. By holding their ground, they retained a certain power that in time would have to be recognized. They stayed and dug themselves in. Perfectly natural, understandable and commendable. Is it fair to deduce that the Cantonese leaders, smarting under their defeat and in order to make their program stick, induced their army to resist Japan to the point where Chiang Kai-shek would have to give in, and fight Japan ? If the Canton army was operating in the beginning as a unit of the National forces, why was not Generalissimo Chiang in command of such an important action? Is it possible that Chiang Kai-shek does not dare to entrust his person to the loyalty of his Cantonese divisions, who remember the trick he played on their idol, Hu Han-min ? Chinese warfare probably has not changed overnight, and it is quite understandable that the Generalissimo of the Chinese armies would not care to move around without his own armies at his back.

Or, to leave this phase of the subject, is it logical to infer that the gallant resistance of the 19th Army is the direct result of a determined and set policy to provoke international intervention at all costs over Manchuria ? The Chinese see Manchuria being transformed into an autonomous state with no opposition from the outside Powers to check Japan and restore his patrimony to the Young Marshal. Did the Chinese, in conformity with their oft-expressed policy to compel international intervention, "**in disappointment and desperation and with little regard for the consequences,**" decide to take advantage of the explosive Shanghai situation to precipitate a world issue that would bring us all into the Manchurian mess ? The answer to this question is found in every official and semi-official statement emanating from the Chinese Government since the night of January 28.

Mr. Lo Wen-kan, Minister for Foreign Affairs, stated on February 6 :

> "It is inconceivable that in considering the general situation brought about by the military aggression of Japan, the so-called Manchurian question can be treated separately from the question of Shanghai."

The following day, another statement to the same effect was made by Mr. Quo Tai-chi, vice-minister for Foreign Affairs. Mr. Wang Ching-wei, President of the Executive Yuan issued a similar statement from Loyang on February 5, and added :

> "If the Chinese Government had been willing to sign, like Yuan Shih-kai, treaties like the notorious Twenty One Demands, the whole affair would have been settled long ago.. Because we refuse to sign such treaties, Japan has attacked Mukden, Tsitsihar, Chinchow, Harbin and Jehol purely with the purpose of forcing China to surrender her sovereign rights under armed pressure. In view of the fact that the Chinese Government continues to remain firm in refusing to sign such treaties, Japan has decided to take further steps."

There is no record that Japan has asked China to sign any new treaties surrendering her sovereignty. Mr. Wang's statement is the Chinese way of saying that his government will never recognize the 1915 Treaty. The record to date, reveals that Japan has merely demanded that China live up to the treaties and agreements she has already signed.

General Tsai Ting-kai, Commanding the Chinese Army around Shanghai, concluding an interview published in the *North-China Daily News* (February 8) remarked :

> "The remaining point emphasized by the Japanese Admiral was that 'Shanghai is an entirely separate issue from Manchuria.' The Admiral, I notice, failed to give his reasons. The Manchurian conquest is practically ended because Japan's ambitions there have been realized but the epilogue to the Manchurian show is being performed here."

Dr. W. W. Yen, at Geneva in his appeals to the Council has also insisted that the root of the Shanghai matter lies in Manchuria. On February 15, a number of the Central Committee members of the Kuomintang, headed by Mr. Sun Fo, issued a circular telegram to the country urging what for all practical purposes amounts to a declaration of war, national support to 19th Route Army, a general offensive in the North to recover control of Manchuria, etc. and closing with the reminder that the Shanghai situation could not be treated separately from the Manchurian question. Up to the last minute in the negotiations which preceded the expiration of the final ultimatum of General Uyeda, the Chinese side insisted that the local situation could not be considered apart from Manchuria and that an international commission should take part in the settlement.

The real story of Shanghai remains to be told. It may never be told. It is too early for the world to pass judgment on who was responsible for what happened on the night of September 28. For the present the surface evidence would indicate that the Japanese Admiral exceeded his instructions, underestimated the fighting qualities and power of resistance of the Chinese troops and attempted to carry through a minor military operation with an insufficient naval landing force, creating a situation so fraught with danger to the prestige of Japan that the army had to be dispatched to extricate him from his peril and preserve the honor of the nation. The Japanese blundered, but the evidence is irrefutable that they walked right into a Chinese trap skilfully prepared in advance to create a situation that would focus world attention upon Shanghai and force international intervention against Japan in the hope of bringing Manchuria into the picture.

The 19th Route Army is worthy of every praise for its gallant resistance, even though it was against a much inferior, but better equipped force. It has retrieved the honor of the Chinese fighting forces and shown to the world that the Chinese will fight. They may have been animated by a spirit of pure patriotism in defending their native land against the invasion of Japanese armed forces.

If so, and a Cantonese army on its own initiative will defend another province against outside aggression, there is hope for China. It marks the beginning of a new era in the Far East, the evidence of a new spirit that will save China from extinction as a nation. All honor to brave men!

On the other hand, all the eulogies and admiration expressed for the 19th Route Army does not detract in any way from the simple statement that it dared not retreat in any direction from Shanghai without encountering the armies of hostile war-lords allied with Chiang Kai-shek. Withdrawal from their position around Shanghai and repatriation to their native province meant the end of Cantonese influence at Nanking. Their political leaders were here in Shanghai demanding war with Japan and urging their army to sit tight and fight it out. And behind it all was the great prize of Shanghai, the only place in China left to loot, the treasure house which furnishes sixty-five per cent of the revenues of the government. Patriotism is a wonderful thing, but practical politics is quite synonymous with this virtue in China.

In this land of make-believe, it is well to keep the proper perspective on things. The Chinese diplomats and statesmen have placed on record on various occasions their government's policy towards Manchuria. They refuse to recognize the legality of treaties and agreements which do not conform to their ideas of sovereignty and nationalism and before they will acknowledge the validity of the 1915 Treaty, they will carry out their threat to create a situation whose consequences upon the stability of international relations cannot be estimated. Convinced that the League or the United States will not go to war with Japan or apply economic sanctions against her for acting in self-defense and confronted with having to face Japan alone over an issue she has for seventeen years sought to shoulder on to other nations, China in sheer desperation and disappointment has provoked what she hopes will be a world crisis, without any thought of the consequences upon world peace or the stability of Europe.

There is another side to this Manchurian picture. For the moment, there is no Chinese Government, but such as there is, its official spokesmen are all henchmen of Marshal Chang Hsueh-liang. The Minister of Foreign Affairs, Mr. Loh Wen-kan, held the same position in the Mukden Government up to September 18. Dr. W. W. Yen, China's representative at Geneva, is a Peking official of the old Northern Group, affiliated with the Young Marshal, while Dr. Wellington Koo, Chang Hsueh-liang's right-hand man has been appointed to accompany the League Commission to investigate Manchurian affairs. The key positions in China's foreign relations for the moment are therefore held, not by Kuomintang officials, but by representatives of the Young Marshal, the Co-Ruler of China, whose sole object is to regain control over the province and its revenues.

In all the publicity, propaganda and official statements over Manchuria emanating from the Chinese side, not a word has been said, not a promise has been made, that the rights of the peoples of the Three Eastern Provinces to a voice in their own government are to be recognized. Restoration of Manchuria to China, simply means its return to the rule of Chang Hsueh-liang and the further enslavement of its people to the yoke of a pitiless bandit oilgarchy. Were there any indication, however slight, that the rights of the people of Manchuria to a share in their own government were to be recognized, China's case against Japan would be immeasurably strengthened. But as long as the whole weight of Chinese diplomacy is concentrated upon restoring the dictatorship of a war-lord and his rapacious armies, and the world is expected to intervene to perpetuate such an injustice, there is little hope that any sympathy will be wasted on a system which is repugnant to every right-thinking man.

The daily news aspects of the developing Shanghai situation will absorb the attention of the world and overshadow the fundamentals of the real problem. If China is successful in her diplomacy and propaganda, the whole world will be drawn into a war over a purely local incident in order to gain her ends in Manchuria and escape having to recognize a treaty which rightly or wrongly she rejects because she claims it was extracted under duress. So we come back to where we started, to a Spring day in May, 1915, when a high Chinese Foreign Office official confided to the Japanese Minister at Peking that the Manchurian Treaty would be expedited and at the same time provide a plausible excuse for the President of China to sign it, if Japan would only hand in a little ultimatum that would save their face. The astute Japanese Minister, who ought to have known better, jumped at the bait and was hooked. He placed a weapon in the hands of the Chinese that they have since employed to justify their refusal to recognize the treaty.

China will never admit the truth concerning her invitation to Japan to send in the ultimatum, and will insist upon dragging the whole world into the dispute. If she finds that she must settle with Japan without outside assistance, rather than face Japan alone, and recognize the 1915 Treaty, she will go down to ruin and carry the rest of the world with her. This is the real issue behind the Shanghai incident.—G.B.R.

FUNDAMENTALS

WARS are rarely precipitated overnight. It takes time to create suspicion, provoke resentment, engender hatred, marshal public opinion and fire the hearts of a people to the point where they are ready to fight for something that does not immediately affect their own security. It took three years of violent newspaper misrepresentation, invective and villification to convince the American people it was their duty to go to war with Spain to redress the wrongs of Humanity in Cuba. Even then, it could never have been done, if the battleship *Maine* had not been destroyed in Havana harbor, by an explosion whose causes are still shrouded in mystery. Ninety-five per cent of the stories in the American press about Spanish atrocities and inhumanity had no foundation in fact. Invented in the fertile imagination of Cuban *laborantes* and confided in deep secrecy to sympathetic American war-correspondents they were wired to their home offices as the latest news from the "front." It worked. It always works.

It took the same length of time to find a slogan that would move the American people to participate in the Great War, redress the wrongs of the Belgians, liberate the German people from the yoke of their military taskmasters, destroy the Divine Right of Kings and make the world safe for Democracy. Again, it worked. We then sent as American army to Siberia to make Asia safe for Bolshevism. That also worked. It then became our bounden duty to ally ourselves morally with our Asiatic "Sister Republic" to put an end to autocracy and militarism in this part of the world. We broke down the "imperialistic" Anglo-Japanese Alliance, in order that the new democracy of Russia should have free scope for expansion and provide republican China with the most unembarassed opportunity to develop into a first class power worthy of our assistance in making this part of the world safe and secure for the principles that underlie our conception of things-as-they-ought-to-be. Our Sister Republic however ,had her own fish to fry. Solely intent upon punishing and humiliating Japan, China hailed with joy the prospect of duplicating her secret diplomacy of 1896 when she unloaded upon Russia the task of fighting her battles. Instead of putting her own house in order and proving worthy of the confidence reposed in her ability to establish a modern state and taking over her international responsibilities, China utilized her freedom from outside intervention to indulge in a series of ferocious civil wars that split the country into several independent states which, by the courtesy of the Powers, are still recognized as a political entity in order to facilitate the conduct of international affairs. Safe in the arms of the League, protected by the Nine Power Treaty and Kellogg Pact, China settled down to a prolonged period of internal warfare, abrogation of treaties and disregard for the rights of other nations,

Convinced that in due course, America would fight Japan over the supremacy of the Pacific, the Open Door or some other issue connected with the preservation of her integrity, China has conducted a violent propaganda calculated to inflame American opinion against Japan. Americans have deluded themselves into a belief that in some way their national honor and self-respect is involved in the preservation of principles they expect Japan religiously to uphold while accepting as a matter of course Russia's cynical disregard and violation of the same doctrines.

The climax that any school-boy could have foreseen came on the night of September 18 and from that date the process of marshalling world opinion against Japan has been in steady progress. Handicapped from the outset in presenting and explaining her case in the face of universal prejudice and suspicion, Japan was condemned as a violator of treaties, an outlaw nation that had lost all sense of moral and treaty obligations. That China had steadily violated her treaties with Japan and provoked the latter to act in self-defense, counted for nothing before the more important fact that Japan had violated her treaties with the United States and other Powers.

The world has a short memory. As far back as 1927, when the Nationalist Government abrogated its treaty with little Belgium, Chiang Kai-shek announced that this abrogation was the first of others to follow. "*We will execute no treaties such as were signed by former governments, nor will we at any time recognize any treaties or agreements which were made with other nations by any government in China previous to that of the Nationalist forces.*" Faithfully adhering to this program of treaty denunciation, the Nationalist Government has been encouraged by the passive attitude of the United States and Great Britain to believe that it could get away with it. Only when Japan struck to defend her vital interests in Manchuria, did the rest of the world suddenly recall that there was such a thing as the sanctity of treaties and its wrath fell, not upon treaty-breaking China, but upon Japan. In protecting herself against the violation of a treaty vital to her existence, Japan automatically became the violator of other treaties.

A nation that sees itself forced into a corner by the operation of treaties which circumscribe its powers of defense while its traditional foe is permitted full freedom to pursue predatory policies without a word of protest on the part of other Powers, will sooner or later assert its right to self-preservation. Technically, Japan is wrong, but to a man her people believe they are right. As far as Manchuria is concerned, Japan has an exceptionally strong legal case that commands respect and unprejudiced consideration. China has an equally strong moral case, but one which can not be brought before an international tribunal with any hope of receiving a favorable verdict. Once the validity of a treaty extracted under duress comes within the purview of the League of Nations or the World Court for revision, the whole post-war international structure is menaced with collapse. If Japan admits that it is a matter even for discussion, the precedent will be created for a score of other nations to demand the reopening of issues now closed through the application of force. The Chinese Government and the Chinese people adhering tenaciously to their refusal to admit the validity of the 1915 Treaty, demand that the rest of the world come to their aid to compel its revision. Rather than face Japan alone and settle her dispute by mutual agreement, China would drag the whole world down to ruin to achieve her ends.

Leaving aside the economic and legal aspects of the Manchurian problem, the Chinese case is weakened by the non-existence of a government that can discharge its international duties and guarantee its own territory and Japan against attack or aggression from the direction of Urga. China has made no effort to regain possession of Mongolia, or defend herself against the Red menace. International law justifies Japan in violating China's territory in order to protect herself while there is yet time to do so. A year hence, it would have been too late.

It is easy enough to condemn the military leaders of Japan for taking the initiative away from the ministry of foreign affairs and arrogating to themselves the right to dictate the policy of the government. When a nation sees its security whittled away to the vanishing point and its powers of resistence undermined by a long drawn out ineffectual policy of conciliation which surrenders its right to defend vital interests in territories where its very life is at stake, the time must arrive when those whose duty it is to defend the nation will call a halt.

Japan's military leaders are no different from those of other nations. No British government, no matter how liberal or how radical, would dare set aside the two-power naval standard of the Admiralty. There is a limit to disarmament, conciliation and surrender of the right of self-defense even in Great Britain. The same holds true in France. The French people demand security, preferably through pacts which bring us all in on her side in any future war. Failing this, they wisely provide their own security and woe betide any government that would run counter to the basic defense plans of the General Staff. Even in the United States, there is a limit beyond which no Congress would dare go in disregarding the advice of the General Staff of the Army and Navy in any matter affecting the security of the nation. Should the day ever arrive when the security and national existence of the United States is jeopardized by the conciliatory policy of a pacifist cabinet or Congress, our experiment in democratic government will also give way to a military dictatorship.

It is popular at the present time to condemn the Japanese military leaders and ignore the reasons which compelled them to retain a supervisory direction over the external policies of their government. Fifteen years ago, their attitude could be readily justified; to-day, when peace pacts rule the world, their interference in political affairs cannot even be explained. Of all nations, Japan is the only one that world opinion refuses to concede the same right of self-defense that the United States and Great Britain lay down as a fundamental condition to their adherence to the war renunciation pacts. Yet, if fair-minded observers would remember only the high points of events of the past thirty-five years, they will understand something of the motives which explain much that is otherwise condemnatory and contradictory.

Deprived of the legitimate fruits of their victory over China in 1895 by the intervention of the three strongest military powers; humiliated further by seeing China hand Manchuria over to Russia, forcing them to fight another war to preserve their independence; the military leaders of Japan then watched Russia enter into stupendous preparations to resume the conflict. This war of *revanche* was scheduled to take place in 1912. To keep pace with Russia's open preparations to regain her lost prestige in Eastern Asia, Japan was compelled year by year to increase her military establishment to the point where it became a serious drain on her resources. At no time from 1905 to 1914 did Japan dare to relax her vigilance. During the Great War, the Japanese military leaders took advantage of the opportunity to impose a new treaty upon China in order to strengthen their strategic position and in so doing incurred the enmity of other powers. As usual with Asiatics, the Japanese demands were all embracing, in order to get the one thing they wanted. They got just that and no more, and from the evidence now available, the Chinese made no objection to conceding this point.

In order to maintain the doctrine of the Open Door, the Consortium Powers forced Japan to surrender her outer line of strategic defense against the menace from the direction of Urga and lay herself open to a flank attack in South Manchuria by the forces of the Soviet. They tore down Japan's defenses but made no agreement to come to her assistance in the event her security was endangered. They went further and destroyed the one bulwark for peace in the Far East by cancelling the Anglo-Japanese Alliance, leaving Russia to pursue her policies in Asia without fear of restraint. Rightly or wrongly, legally or illegally, by force or by persuasion, by hook or by crook, Japan consolidated her position in Manchuria. Viewed as an isolated episode, her tactics were indefensible, but when considered in the light of previous events and subsequent revelations of China's secret alliance with Russia which brought on the war of 1904, it is difficult for any unprejudiced mind to wholly condemn Japan. In an understanding with Great Britain and France for the defense of Allied war aims in Siberia, Japan was to take over the Trans-Siberian Railway, occupy Vladivostok and be compensated by a slice of Siberian territory that would have enabled her to defend the Far East against the spread of Bolshevism. America intervened to deprive Japan of this opportunity to strengthen her position by obtaining a foothold on the mainland, dispatching an army to see that there should be no interference with the internal affairs of Bolshevist Russia. Defeated again at a great cost to the nation, and finding themselves in disrepute, the military leaders of Japan refrained from further interference in the affairs of the nation and left the formulation and direction of foreign policies to the politicians. It is needless to go through the weary story beginning with the Washington Conference, the signing of the Nine Power Treaty and ending with the ratification of the Kellogg Peace Pact. Everything the Japanese army had fought to retain for the defense of the nation was gradually surrendered in an honest attempt to gain the good will and support of the world. They remained passive while Russia took over Mongolia. They saw China enter into another secret agreement with Moscow and the country come under the domination of Soviet agents. They saw communism rear its head in Central China and convert the Yangtsze Valley into a Soviet stronghold. They saw the Mongol tribes organized into modern armies and trained "to a gnat's eyebrow" under efficient Soviet direction. They saw the creation of a vast Soviet army with a special Far Eastern department based on Irkutsk and Chita. They have watched the development of the Five Year Plan and Russia's open preparations to assert her dominance in Eastern Asia. They see the erection of a 1,250,000 ton steel mill at Kuznetsk in the Altais with another enormous 2,500,000 ton mill in the Urals. These plants are nearing completion. The Trans-Siberian railway is being double-tracked and improved. The Siberian Turkestan Railway encircling the Far Western provinces of China and Mongolia is completed. In another year, Russia would be in an invulnerable strategic position in Northern and Central Asia. Russia was not a member of the League or a signatory to the Nine Power Treaty. China could not and would not discharge her obligations and defend her own territory. The menace to Japan was real and imminent. This is the picture as seen by the military leaders of Japan.

They saw China enter into a program of rights recovery through the abrogation and violation of treaties, culminating in a final effort to compel them to surrender the 1915 Treaty on which their rights in Manchuria are based. They saw China declare an economic war to enforce her diplomacy. They saw their goods confiscated, outrages committed upon their nationals and all attempts to obtain redress rejected. Within a year, two years at the most, the Soviet would have completed its plans in Siberia. With China already half communized and Mongolia as part of the Soviet system, the outlook for the Japanese military leaders was far from bright. They saw their investments and trade in Manchuria ruined by an outrageous system of confiscation and taxation. They saw the province impoverished by the issuance of billions of worthless paper notes exchanged for the crops of the farmers which were sold for gold to maintain a bandit oligarchy and its formidable armies. The other Powers, seemingly indifferent to their interests in China, were willing to surrender everything rather than incur the enmity of the Chinese. Even Japan was willing to surrender all her rights in China proper to placate Chinese nationalism, but was told that nothing short of abrogation of the 1915 Treaty and the withdrawal of her troops from Manchuria would satisfy Nanking. Japan's policy of conciliation failed. The military leaders found the nation with its back against the wall, their hands tied by peace pacts, treaties and League commitments which forbade any move that could not be justified by the law of self-defense. It matters little who started the rumpus on the night of September 18. The Chinese assert that it was a put-up-job. Maybe it was. It happened, Japan invoked the right of self-defense and the world is faced with the accomplished fact.

Let us also admit that Japan blundered, but she took an even chance with a nation that rejected any direct negotiation over a vital issue that could not be settled by pacific measures. It is useless for China and uninformed public opinion to insist that the validity of the 1915 Treaty is a matter for League interference, international arbitration or even for discussion. To admit the Chinese contention is to invite a concerted onslaught on the Versailles Treaty and many other pacts upon which world peace and stability is founded. To even expose these treaties to any precedent that might invalidate their provisions or destroy their efficacy is to invite disaster. If China is upheld, it is only a question of time when the whole post-war international edifice will crumble and another conflict wipe out the last vestiges of Western Civilization.

The question is therefore one that concerns solely China and Japan. China's refusal to discuss the matter with Japan while insisting upon the latter's surrender of her rights and employing economic pressure and confiscation of Japanese property to enforce her viewpoint, together with other acts which clearly reveal her intentions to drive Japan out of Manchuria, are, for all practical purposes equivalent to a declaration of war. Under cover of the peace pacts and the League Covenant, China has been at war with Japan since last July. From the military viewpoint and strict interpretation of the treaties, Japan is the aggressor. There the matter rests. Unless the other Powers are willing to establish the precedent that will undermine and destroy the validity of their own imposed treaties on other states and thus hasten the day of reckoning in a discontented Europe, they dare not comply with China's impassioned appeal to interfere in her dispute with Japan over the legality of the 1915 Treaty.—G.B.R.

Our Isle of Safety

THE night of January 28th, shocked the people of Shanghai into a realization of how wars are fomented. There was nothing new or exceptional about a situation, which reduces itself to a simple arithmetical problem, in which the unknown quantity was the hour and place where the answer would be turned in. It was as certain as two and two make four that an end would come to the incredible patience, forbearance and tolerance of the Japanese under the most severe provocation and insulting challenge. In carrying their economic war against Japan into the International Settlement and waging it in an illegal manner to the point where there was no redress, the Chinese created a situation where the application of force became inevitable.

If there were 30,000 Americans residing in Shanghai and its environs, mostly small merchants, clerks and others of the same economic class, and they found themselves through no fault of their own, subjected not to a spontaneous boycott but to an illegal interference with their business carried to the point of having their cargoes confiscated after paying import duties and consolidation taxes, sealing their goods in the warehouses and in other ways driving them into bankruptcy, and there was no redress or hope of protection under the laws of China, it would require more than moral suasion to hold their indignation within bounds. Japanese cargo to the value of $80,000,000 (silver) in now sealed in the warehouses of Shanghai while approximately $8,500,000 worth of Japanese goods have been seized by the Anti-Japanese Patriotic Associations and sold to provide funds for carrying on their campaign. Some of this money ($3,300,000) it is alleged, has been paid to the 19th Route Army.

This is bad enough, but, if in addition, the American community woke up some fine morning to find every Chinese shop window flaunting the vilest and most insulting anti-American posters, depicting them as monsters and inciting the people to arise and "kill the enemy," the reaction would be immediate and certain. If the Municipal Council failed within a specified number of hours to remove these provocative posters, Americans would take the law into their own hands. That the Japanese failed to retaliate in the same manner is due merely to a different psychology.

We use the American comparison for the reason that the same thing may happen to us at any given moment. We make the categoric statement, that Chinese friendship and enthusiasm for America is maintained at the expense of our own self-respect. If, at any time, the police authorities of New York or any of our large American cities, should carry out their threat to deport wholesale the Chinese within their jurisdiction, as the only way to end their periodic Tong wars, or, should the Philippine Government adopt similar drastic measures and round up and deport the thousands of Chinese who have boot-legged themselves into the Islands, Americans in China will feel the weight of Chinese vindictiveness in the only way they know how to express their grievances and enforce their viewpoint. It is very easy for the United States to get into war with China.

The foreign and Chinese press in Shanghai are now indulging in an acrimonious mud-slinging debate over the violation of the Settlement's neutrality by Japanese armed forces using it as a base of operations. The Municipal Council, in answer to Chinese protests, disclaims responsibility, pointing out that it is not a sovereign state and that it cannot take direct measures either forcibly or diplomatically to uphold the principle of neutrality. The Chinese, however, insist that the Settlement Government as an international body must take immediate steps to constrain the Japanese from using the Settlement as a base and places on record their refusal to accept any responsibility whatsoever for any damage that might be done to the lives and properties of foreigners as the result of war operations. Analyzed, the Chinese contention calls for international armed intervention to preserve the neutrality of the Settlement, which would then compel the Japanese to land their forces outside the Settlement limits. This, of course, constitutes a Japanese invasion of China and violation of the treaties which again would necessitate international intervention.

In the heat of passions aroused by the conflict now raging around Shanghai, it is impossible to fix definitely the blame. In due course, a commission of inquiry will be convened to investigate the facts and submit a report upon which judgment will be based. The high lights of the dispute are briefly, but clearly outlined in the first League Report, which seems to be an accurate and impartial statement of facts. It will be left to the League or some other international commission to hand down the verdict as to which side first violated the neutrality of the Settlement. In such a finding it will be difficult to set aside the evidence of China's economic warfare against Japan carried on since last July under cover of the protection extended by a community which although preserving its police authority has surrendered its right to enforce the law.

If the Chinese are to be permitted to use the International Settlement as a base for their boycotts, anti-foreign activities and illegal confiscation of foreign goods, if it is to harbor all the discontented political leaders of China and become for all practical purposes, the political capital of the nation, the funk-hole of its politicians, the center of conspiracy against the recognized government, the home of unrest and the goal of its armies ; then, its future status must be either a real isle of safety for foreign trade and residence, or an out and out Chinese city subject to Chinese jurisdiction, policing and taxation. We cannot have it both ways. Its present status is, in effect, that of a huge foreign prison on Chinese soil, surrounded an all sides by Chinese armies, with the outside roads patrolled by swaggering soldiers, who insult, arrest, turn-back, beat up or kill the unfortunate inmate who wanders outside the limits of his gaol seeking the blue sky and fresh air. The International Settlement of Shanghai may be an isle of security in an ocean of unrest, but it is also the last place in China left to loot, the objective of every aspiring war-lord and army in the country. The army that dominates Shanghai, rules China and pockets its revenues.

Unless the Powers come together in some plan for the future safety of the Settlement by extending its limits or creating a zone that will keep the Chinese military pressure at a safe distance, they might just as well call it a day, finish the farce, scuttle and get out. Unless something like this is agreed to and enforced, there can be no safety for foreign lives and properties in a port encircled by armies intent upon its spoilation.

G.B.R.

While Moscow Laughs

In his statement to the League Council on February 19, Mr. Sato, the Japanese delegate, defending Japan's actions in Manchuria, said :

"We cannot give way there ; it is a question of life or death for us. Has the League protested against the disappearance from the Chinese map of Outer Mongolia ? Yet it is gone entirely. Before condemning us for our actions in Manchuria, although we protest our innocence of territorial ambitions, the Council must investigate the case of Outer Mongolia."

In his reply, Dr. Yen, the Chinese representative remarked that **"the Soviet seizure of Outer Mongolia occurred before the League was constituted and it was therefore absurd to suggest the League could take up the matter."**

The 1915 Treaty was signed before the League was constituted, yet China does not consider it absurd or inconsistent to demand that the League commit suicide, plunge Europe into chaos and drag the United States into a world war, in order to attain her own ends and compel a revision of that treaty by international intervention !

In his statement before the League Council, the Chinese representative does not adhere to the facts. The collapse of Imperial Russia was immediately followed by China reasserting her sovereign rights over Outer Mongolia and for more than two years, "Little Hsu" and General Chu Chih-hsiang ruled at Urga as representatives of the Peking Government. Their barbarities, outrages and excesses turned the Mongols against them and opened the way for Baron Ungern's army to capture Urga, enthrone the Hutukhtu and declare an independent Buddhist state.

Ungern was defeated by the Soviets who set up a Mongol People's Government, which in July, 1921, begged Moscow for military assistance. Four months later, (November 5, 1921) just five days before the opening of the Washington Conference, the Mongol Government signed a treaty of peace and amity with Soviet Russia. The Nine Power Treaty, guaranteeing the sovereignty, the independence and the territorial and administrative independence of China, was signed on February 6, 1922. In August 1922, the Mongol People's Government decided to be guided by Moscow in its policies and the few remaining Chinese were expelled from the country. Moscow, however, in its treaty with China of May 31, 1924, recognized Outer Mongolia as "an integral part of the Republic of China," wherein Russia respects China's sovereignty.

For all practical purposes, Outer Mongolia was incorporated in the system of Socialist Soviet Republics, taking its orders from Moscow, while officially acknowledging the sovereignty of China. On paper therefore, Outer Mongolia is still a part of China. All that is necessary to complete the picture is for China to enforce its rule and discharge its international obligations.

This unique international situation is accepted by the League of Nations and the United States as being entirely consistent with their ideas of the Open Door and China's unimpaired sovereignty. The League has made no protest nor has any signatory to the Nine Power Treaty objected to the situation as a violation of that instrument. On the contrary, all except the United States have entered into treaty relations with the Soviet, thus technically violating Article II of the Treaty. It is only necessary to check up on the dates, in order to refute Dr. Yen's statement and establish the fact that the rape of Mongolia took place subsequent to the constitution of the League and the ratification of the Nine Power Treaty. China failed to invoke the League's aid when Russia incorporated Outer Mongolia into its system of Soviet republics, nor did it call a conference of the signatories to the Nine Power Treaty to discuss measures to be taken against this violation of the treaty. It meekly accepted the accomplished fact and her frontier armies instead of asserting her rights of sovereignty have constituted themselves into allies of the Mongols and the Soviet to prevent Japanese observers from penetrating into the territory.

Has Japan the right to defend herself against the "*menace from the direction of Urga*," by employing the same methods that Russia has employed in flanking her position in South Manchuria ? This is the real issue that underlies the Japanese case in Manchuria. When Dr. Yen asserts that it is absurd to suggest that the League should interfere over Outer Mongolia, he not only commits a grave diplomatic blunder in misstating the facts, but kills his own case in the matter of the 1915 Treaty.

If Japan is denied the right of every sovereign state to protect itself against a condition of affairs in which it will be too late to

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The Difficulty

Determining the Aggressor

A WAR that is not a war is now in progress. The world is face to face with the ages-old problem of determining the aggressor when both sides to the dispute appeal to the law of self-defense to justify their disregard of the Pact of Paris. In self-defense, Japan is protecting the lives and properties of her nationals in China through armed intervention while the armies of China are defending their soil against invasion. The Kellogg Pact renouncing war as an instrument of national policy left to each nation to define for itself the right of self-defense and furnished no machinery to determine the aggressor or sanctions or methods to bring pressure to bear upon a violator of the treaty.

When two nations at war allege that they are fighting in self-defense, thus making difficult if not impossible for outside powers to determine who is the aggressor, intervention or the application of sanctions can only complicate the situation and precipitate a world catastrophe. As every nation is free at all times and regardless of treaty provisions to defend its territory from attack or invasion, China is eminently justified in resisting the armed intervention and invasion of her territory by Japan. On the other hand, it has become more and more recognized under international law that violations of other States in the interest of self-preservation are excused in cases of necessity only. As both China and Japan can make out a strong case under the above principles, the equities of the war are not clear enough to warrant the application of positive measures by outside powers to stop the conflict.

The difficulties surrounding the implementation of the Pact of Paris are very clearly and forcibly brought out in the latest issue of "International Conciliation," the monthly bulletin of the Carnegie Endowment for International Peace. In an article entitled "What Follows The Pact of Paris," Mr. John B. Whitton, Professor of International Law at Princeton University, shows how the pact can be implemented and made effective by the enforcement of economic sanctions against the aggressor state.

The argument is openly in favor of the United States joining the League of Nations or at least of entering into full and harmonious co-operation with this body and will be hailed as a most important contribution to the campaign to bring America into the League. In view of what is happening in Shanghai, Professor Whitton's exposition of the problem of self-defense is of special interest and importance in attempting to clarify the difficulty in applying the pact. He says: "Closely allied with the question of fixing the aggressor is the problem of self-defense. This matter is of great importance to-day. Formerly, when all wars were *prima facie* licit, it was really immaterial whether a war was aggressive or defensive. Both were legitimate. Both were equally "just," and both required of non-belligerents an attitude of impartiality towards the warring parties. But to-day, self-defense, individual or collective, is the last refuge of war. Furthermore, in case of an illicit war among League members, an attitude of impartiality toward the belligerents is no longer required. In some cases, impartiality would violate the Covenant.

"It is now well-established under the Pact of Paris that a war of defense is an exception to the promise not to resort to war as an instrument of national policy. This exception was further complicated by Great Britain's alleged extension of the right of self-defense in the so-called 'British Monroe Doctrine,' and by the view adopted by our Senate that our own Monroe Doctrine is based upon self-defense—that a war made in defense of the Monroe Doctrine would be an exception to the Pact.[*] According to some authors, the exception of self-defense has emasculated the Pact for, in their opinion, legally any nation may make war and escape a violation of the Pact merely by declaring that it is fighting in self-defense.

"The subject is too complex for adequate treatment here, but it would seem that these difficulties have been over-emphasized. It is true that the Pact itself sets up no definition of self-defense. It envisages no machinery for testing the claim that a given war comes within the exception. But almost all of the parties to the Pact are also parties to the Covenant. Thus for most States self-defense is carefully regulated as a part of the League system. In fact, one author has suggested ironically that the best solution for this difficulty is for the United States to join the League of Nations.

"As regards League members, self-defense is subjected to extensive supervision. At least three checks against war, including a war in self-defense, have been set up, and may be divided into measures of prevention, moratorium, and retrospection. *Preventive measures* include the obligation to submit all disputes liable to lead to a rupture—whether a matter of self-defense or not—to examination by the League. If the parties do not accept judicial or arbitral settlement, then the matter goes to the Council for investigation and report. If the report is unanimous, no member may make war against a State accepting the report. In addition, the League possesses divers means, and enjoys a high authority, for acting to avoid war. *Moratorium*: whatever happens, member States may not make war until three months after a report of the Council. And even in such case of a licit war, the Council, under Article 11, can act effectively to restore peace. *Retrospection*: even if a member declares war, claiming to act in self-defense, his action may be reviewed *après coup*. That a member of the League cannot, by alleging self-defense, act with impunity, was shown graphically in the Greco-Bulgar affair. League members are not free to define self-defense. If one of them acts in self-defense, he does so at peril. An international body examines the question of whether the claim is valid. In short, a type of international control exists to prevent the abuse of the doctrine of self-defense.

"Naturally this system of control of self-defense does not obtain for non-members. Thus the problem, if the alleged aggressor is not a member of the League, is less simple. We can hardly agree with Mr. Kellogg that public opinion alone would prevent an abuse of the exception of self-defense,[†] although no doubt it would have a beneficial effect. Certain defects must be admitted. There is no clear and adequate definition of self-defense in international law. Nevertheless, for the American continent, there exists the Pan-American Treaty of Conciliation, whose effect should be to postpone war. Furthermore, legally minded critics of the Pact have exaggerated certain difficulties. Surely upon the State resorting to war rests the burden of proving that its action is in conformity with self-defense. Some rules of international law governing self-defense do exist.[‡] It would be absurd to claim, for example, that the United States could declare war on another nation in order to annex certain rich oil lands, and allege she was fighting in self-defense. The contention that we would be our own judge in the matter of self-defense, although made on high authority, seems too strong. It would not apply to us if we agreed to arbitrate the matter. If a dispute arose between us and another American State as to whether we had acted in self-defense, we would be obliged to submit the matter for review to the Pan-American Conciliation Commission. Finally, we are bound by international law, under which there are certain limits to the exercise of the right of self-defense. It would be equally unreasonable to claim that since every treaty is subject to the exception known as *rebus*

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[*] "The United States regards the Monroe Doctrine as a part of its national security and defense. Under the right of self-defense allowed by the treaty must necessarily be included the right to maintain the Monroe Doctrine, which is a part of our system of national defense." Report of Senate Foreign Relations Committee, *Congressional Record*, Vol. 70, part 2, p. 1730.

[†] "Every nation is free at all times and regardless of treaty provisions to defend its territory from attack or invasion and it alone is competent to decide whether circumstances require recourse to war in self-defense. *If it has a good case, the world will applaud and not condemn its action.*" (Italics ours.) American note of June 23, 1928. Shotwell, *op. cit.*, p. 297.

[‡] For example, see Oppenheim, *International Law*, 4th ed. (McNair), Vol. I, p. 257: "It becomes more and more recognized that violations of other States in the interest of self-preservation are excused in cases of *necessity* only."

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Junnosuke Inouye

In the death of Junnosuke Inouye, Japan has lost one of her greatest sons, the world one of the group of outstanding Liberals whose principles and program carried out through the post-war period have contributed largely towards the establishment of world peace and understanding. To Baron Shidehara, Japan's Liberal Foreign Minister, and to Mr. Inouye, Japan's Finance Minister, is due much of the credit for re-establishing international good-will and understanding of Japan's problems and policies following a period of suspicion engendered as a result of her war activities in China.

As the leader of the financial and big-business interests in Japan, Mr. Inouye long ago realized that the prosperity of his country hinged largely upon maintaining cordial friendship and close relations with China and later, as head of the Japanese Banking Group in the International Consortium, he clearly foresaw that the one hope of a thorough understanding between Japan and the United States lay in harmonious co-operation for the establishment and development of a stable government in China on which the future industrial development of the country through international loans could be made safe and effective.

Junnosuke Inouye

At the end of the war, he realized that if China was to be assisted from the outside to regain her financial feet, the only two nations which could extend this help, were the United States and Japan and, when the American Government in order to make the Consortium a success, offered to take over the British and French shares of the loans until such time as they were in a position to participate on equal terms, Mr. Inouye, as Head of the Japanese Group, committed it to share this responsibility. Despite the opposition of the more conservative expansionists to any surrender of their gains in Manchuria, Mr. Inouye prevailed upon them to meet the wishes of the Consortium Powers as the one way to allay suspicion and cement firmly the relations between Japan and America on a new basis.

He claimed, and rightly, that the surest guarantee of Japan's good-faith in China was a close association with the United States. He also clearly foresaw that co-operation between the two countries through the medium of the Consortium would pave the way for mutual understanding and enduring peace in the Pacific. The success of the Consortium was necessarily based on the principle of full Japanese-American accord, for unless these two nations worked together, China's chance of financial assistance through the Consortium was hopeless.

Mr. Inouye's logic, tact and diplomacy prevailed ; and it was through his efforts that the final consortium agreement was signed. His work of ten years ago is perhaps forgotten in the crisis of to-day. Mr. Inouye's arguments influenced Japan's military leaders to recede from their position on the Taonan-Jehol Railway, which they were insistent upon holding as the outer line of defense of the nation against " the menace from the direction of Urga." Mr. Inouye and his financial colleagues trusted to the good-faith of their British Ally and the United States to see that Japan's vital interests were never placed in jeopardy in these regions by the operations of the Consortium. He staked his reputation and prestige in order to create international harmony and bring peace to the Pacific.

Like all the Liberals of Japan, Mr. Inouye was a firm friend and believer in the future of China and his hope was that some amicable way could be found to deal with the Manchurian question with justice to both sides. Four months ago, just after the present crisis was precipitated, he gave the publisher of the *Far Eastern Review* an hour of his valuable time in order to exchange views on the Manchurian problem. At last, he said ; " What do you advise us to do ? Negotiate ? We are quite willing to negotiate, but with whom ? Where is the Government of China ? Nanking exercises no authority in Manchuria. We would gain nothing but interminable delays by entering into negotiations there. We might be willing to negotiate with Chang Hsueh-liang, but he dares not return to Mukden without his army, and this we will not permit. If he returns alone or with a small escort, the people of Manchuria smarting under their wrongs, would shoot him and we would be accused of plotting the crime. We cannot surrender our hard won rights in Manchuria that have now become vital not only to our economic but our strategic security. We cannot permit outside Powers to interfere in a matter which affects the very life of our nation." Weary with the strain of a full day's heavy cabinet, political and financial duties, the great Finance Minister of Japan again asked very quietly.

" What can we do ? What can you advise us to do ? " And I, knowing that the crux of the problem was the 1915 Treaty, could offer no advice, no solution that the Chinese would even consider, let alone accept. The issues involved were clear cut. China and Japan were facing a stone wall of their own erection, with both sides insistent upon rights which, in view of the Nationalist program of treaty abrogation and Japan's fixed determination to defend and safeguard her security at all costs, could be only settled by force.

His death is a major catastrophe for Japan but the principles and ideals he advocated and established, remain the guiding policy of the nation. Through his personal contacts and association

(Continued on page 72)

Japanese Shipbuilding and Shipping in 1931 and 1932

By Y. TAJI, M.I.N.A., M.I.Mar.E.

THE cause of the world's shipbuilding and shipping depression goes back over one and a half decades to the effect of the Great War, but direct effects appear to be the over-production of goods far beyond requirements and also the serious drop of the purchasing power of the nations of the world. Consequently, the movement of cargoes has been arrested and resulted in serious depression of the shipping and shipbuilding trades.

Therefore, the present situation is abnormal and diverges from the general law of industrial cycles. Thus, the temporary boom in the shipbuilding of Japan was just like the secondary or tertiary wave superimposed upon the tremendously long swell of the worldwide shipbuilding depression, so the transitory prosperity passed away and Japanese shipbuilders found themselves again in the slough of depression.

It is said that "the wise considers his movement most carefully when he is at best, whilst the stupid meditates only when he is in distress. In fact, Orientals are generally fatalists, perhaps influenced with the old Buddhistic idea, so they often fail to prepare for coming distress by establishing a sound permanent policy when they are prosperous.

The words, "Rectification," "Rationalization," "Consolidation," "Re-adjustment" are heard only in times of distress. The Japanese, employ at present such terms in everyday speech so frequently that they lose their own value. At the same time, it shows how deeply we are suffering from the industrial chaos. The famous words of Mr. H. H. Asquith, "Wait and See" and "Too late is better than never," apply exactly to explain the present status of the Japanese shipbuilding and shipping industries.

Now, summarizing last year's shipbuilding records in Japan :—

January 24. The 9,800 ton cargo motorship *Shohei Maru* of Messrs. Shimatani Kisen Kaisha, Ltd., launched in the Mitsui Tama Dockyard.

February 1. The Government Returns for vessels under construction in Japan showed only 23 ships and 78,720 gross tons in total.

March 5. The 6,600 ton motor tanker *Nagisan Maru* of the Marine Department of Mitsui Bussan Kaisha was launched in their Tama Dockyard.

April 3. The 5,840 ton express cargo motorship *Kirishima Maru* of the Kokusai Kisen Kaisha was launched in the Kawasaki Dockyard.

May. Ishiwara Sangyo Kaisha ordered two cargo steamships from Mitsubishi Zosen Kaisha and Harima Dockyard. These being the first Japanese pulverized fuel burning ships fitted with Bauer-Wach's exhaust turbines, a great sensation was evoked amongst shipbuilding and shipping circles.

June 29. M.V. *Kirishima Maru* was completed and attained a speed record of 18.09 knots on the official trial.

July 1. The Government Returns of the Japanese Shipbuilding gave 20 ships under construction and an aggregate tonnage of 46,476 gross tons, so the condition was getting very distressing.

August 20. The fast oil tanker *Fujisan Maru*, 13,000 tons, of Iino Shoji Kaisha acquired the "blue riband" in the world's speed record of oil tankers, by attaining 18.8 knots in her official trial.

September. The shipbuilding returns of September 1, showed 17 ships under construction with aggregate tonnage of 31,211 gross tons. This is the lowest record in 1931. On the 21st, the official trial of the cargo motorship *Katsuragi Maru*, a sister ship of the *Kirishima Maru*, of Kokusai Kisen Kaisha was carried out by the Uraga Dock Company.

On the 25th, the official trial of M.V.*Nasusan Maru* was carried out by Mitsui Tama Dockyard.

October 26. M.V. *Nachisan Maru* of Mitsui Bussan Kaisha was launched in their Tama Dockyard.

November 25. The 1,300 ton oil tanker *Kwaisoku Maru* of Nippon Tanker Kaisha, Ltd. was launched in the Yokohama Dockyard.

December 16. The new cabinet was established by Seiyu-kai Party and the gold embargo was declared.

December 25. M.V. *Kaisoku Maru* on trial.

On December 1, the ships under construction were 29 in number and 53,759 gross tons in total, showing an increase of four ships and 10,000 gross tons over the November returns owing to laying down of the ships for O.S.K. Line and Ishiwara Company.

It is noteworthy that Mitsubishi Shipbuilding Company with three dockyards at Kobe, Hikoshima and Nagasaki acquires 30,165 tons occupying 56 per cent of the total tonnage under construction in Japan, whilst the Mitsui Tama Dockyard holding 11,570 tons *i.e.* 21 per cent of the total tonnage of new construction, these two largest capitalistic shipyards monopolize some 77 per cent of the whole tonnage under construction in Japan.

The majority of the shipyards are now endeavoring to get orders for smaller vessels in order to continue operating. The vessels which they are planning are mainly cargo ships on Far Eastern Waters or coastal service ships of less than 1,000 gross tons, and fishing boats, dredgers, etc.

The trend of new construction from the larger type of ships to smaller classes is on the ground that capital is easily collected and advantageously circulated by the shipbuilders, whilst the owners can take advantage of the drop of initial building costs and also speed can be conveniently increased in smaller vessels. Under such considerations, Osaka Shosen Kaisha set the example by placing orders for four 400-ton and three 700-ton cargo carriers to Mitsubishi Kobe Dockyard and the Osaka Iron Works, respectively.

On the other hand, this shows that O. S. K. has also abandoned the policy of operating semi-cargo passenger ships on home waters and neighborhood, as fast cargo ships are after all more advantageous and economical than ordinary intermediate ships.

Further, amongst smaller vessels, sailing ships equipped with auxiliary Diesels are also advantageously operated for fishing on the Northern Seas, and many of them have been built and are under construction in various shipyards.

Thus, new vessels of smaller types have been recently considered far more economical than large old fashioned vessels without the solidification of capital and the difficulty of collecting it.

Now, looking back at the Japanese shipping situation in 1931, it was not so monotonous and melancholy as the contemporary shipbuilding situation. Conditions turned from bad to worse and then to the worst in conjunction with the Chinese troubles and British gold panic. Then at the end of the year, when the new gold embargo policy was established by the new cabinet a sign was at length seen of the Japanese shipping revival.

In the early part of the year, the dumping of Australian wheat on the Far Eastern market as well as the animated movement of special Manchurian products caused the concentrated operation of large ships in these directions. This considerably relieved the laid-up tonnage. In February, shipping capacity on the Far Eastern waters exceeded one million tons and the shipping market showed remarkable activity with a considerable rise of chartering fees and freight charges, quoting Y.135 for Sakhalin lumber.

This was, however, only a temporary phenomenon and the depression started again from April showing a considerable excess of shipping capacity due to the surplus tonnage of large type vessels and the increase of idle tonnage proceeded with acceleration towards the end of the year resulting in general depression. In October, the cheapest freight charge of Y.45 was quoted on Sahkalin lumber and Y.0.60 for Japanese coal freightage.

In fact, a certain upturn was expected in Autumn due to new corn products in Europe, but the Manchurian crisis on September 18 unfortunately stopped Japanese shipping activity due to the anti-Japanese movement and boycott widely spread over China. Further, on September 21, the suspension of the gold standard by the British government caused a fatal shock to the already crippled shipping trade of Japan owing to the tremendous drop of the exchange rate of English money, as "sterling" has been the standard for freightage on Japanese shippers.

The loss due to the two causes, the anti-Japanese movement and the downfall of "pound" was estimated by the Japanese Shipowners' Association as Y.26,840,000 (*i.e.* Y.18,200,000 by boycott, Y.8,640,000 by exchange, the indirect loss inestimable) to the "Shasen" (*i.e.* the N.Y.K. and O.S.K. Lines), and Y.71,050,000 (*i.e.* Y.37,800,000 by boycott, Y.9,900,000 by exchange and Y.23,350,000 by indirect loss) to the "Shagaisen" (vessels other than Shasen), thus totalling Y.97,710,000 to the Japanese shipping trade.

In addition the Oriental shipping field has been invaded by foreign ships to a very considerable extent, and Japanese ocean shipping has been practically knocked out, resulting in laid-up tonnage of nearly 400,000 tons at the end of the year. However, due to the sudden change of the cabinet and re-establishment of the gold embargo in the middle of December, there has been a certain revival in Japanese shipping owing to the advantageous rate of exchange, but the damage received from the anti-Japanese movement in China is still being felt.

As an epoch-making event in the history of Japanese shipping, it should not be overlooked that an extremely important agreement was arrived at between the N.Y.K. Line and O.S.K. Line on March 27, 1931. The business of these two companies has been at a very low ebb for the last few years, and both had been readjusting themselves. They realized that no more competition being permissible, it was very necessary to rationalize their modes of administration by constituting a "union" or "cartel."

This agreement comprises roughly, (1) mutual respect for their proper routes and the necessity of mutual negotiations for opening new routes, (2) consolidation or readjustment of old routes of operation, (3) common calculation for freightage and joint management of various specified matters, and (4) effective duration of the contract for ten years, etc.

The adjustment of duplicated shipping routes was immediately carried out, in which the N.Y.K. gave up the South American East Coast Line, whilst O.S.K. abandoned their Orient-Seattle Line; consequently the former line is now monopolized by the O.S.K. and the latter by the N.Y.K. For the Trans-Pacific Service, the fixed freightage for superior ships of both the companies had been already negotiated.

Shipping companies other than these two firms were stimulated by this agreement, and in July five companies including Mitsui, Kokusai, Yamashita, Kawasaki and Daido Kaiun formed a shipping association to co-operate for mutual benefits. Further, Yamashita Kisen Kisha and Toyo Kisen Kaisha agreed to utilize commonly their foreign agents under a united management.

The above-mentioned conditions make an interesting contrast with the agreement of twelve American shipping companies for the united administration of ships belonging to the U.S. Shipping Board, in order to stimulate American shipping.

Another special feature in 1931, was the opening of regular lines by tramp shipowners, including the new Java line by Ishiwara Sangyo Kaisha, Philippine route by Mitsui Company and an Orient-New York line by Kokusai Kisen Kaisha.

The Ministry of Communications was considering a scheme for financing shipowners engaging in ocean shipping in order to release them from present difficulties, but it was defeated by the last Minister of Treasury by being kept from entering the budget for the coming fiscal year. This being, however, a very important matter, the new authority is preparing to revive it in an additional appropriation. It should be noted that this is quite different from the Navigational Subsidy Plan hitherto proposed.

The purpose of the new scheme is to furnish the capital to shipowners in the form of a low interest loan to the Bank of Industry mortgaging freightage, the terms being approximately as follows:—

1. The government orders the Bank of Industry to finance the vessels operating beyond Hongkong, by mortgaging the freightage.
2. The interest on the loan is 5 per cent per annum, and the government grants an annual supplement of the interest of 1.5 per cent to the Bank of Industry.
3. The loan shall not exceed 80 per cent of the mortgaged freightage.
4. The Government meets a compensation of 80 per cent of the banker's loss.
5. The utilization of the loaned money is limited to the operating capital of the vessels.
6. In order to avoid unnecessary competition amongst shipowners due to the loaned capital, the authority requests a suitable agreement among them.

The total expense of the government for this scheme is about Y.632,000. so that shipowners can be accommodated with circulating capital of Y.8,000,000 in total and their foreign income is expected to be increased by about Y.5,000,000 per annum.

This plan being highly welcomed amongst shipping circles, it is likely to be approved by the Diet, although a certain delay should be expected due to the dissolution of the House of Representatives.

Returning again to shipbuilding affairs, it should be noted that an agreement came into being between Mitsui and Mitsubishi Concerns in July, last year, in which they agreed upon (1) the common acceptance of orders for shipbuilding and repairs, (2) the common utilization of their shipyard equipments and materials as well as workers for mutual assistance, (3) mutual respect for their traditional skill, and patents and, (4) to co-operate together for building ships of the best quality in view of the national importance of the shipbuilding industry.

On November 12, a shipbuilders association named "Zosen Rengokai" was established by ten leading shipbuilding companies in order to co-operate for the general interest of Japanese shipbuilders in rationalizing their business and to find a way out of the present depression.

New building programs of the Kokusai Kisen Kaisha and Ishiwara Sangyo Kaisha did not materialize last year, but now they are hurrying to place orders for new cargo vessels with some of the shipyards. It is also almost certain that Ogura Petroleum Company is going to build another 10,000 ton oil tanker. So far as new construction is concerned, these are only important ships in prospect, all other proposed schemes having vanished.

The fall of the exchange rate of Japanese money due to the new policy of the gold embargo has given considerable stimulation to the Japanese shipping trade, yet it has not brought any improvement to the shipbuilding industry, but quite contrarily caused a sudden jump of building and material costs which has given a shock to the shipbuilders and marine engineers of Japan.

The bottomless shipbuilding depression in Japan after the last temporary prosperity has compelled many shipbuilders and marine engineers to find relief in other directions by encroaching upon various branches of the land engineering, including motor vehicles, locomotives and railway carriages, bridges and other land structures, water and heat power plants, Diesel engines of land types, light oil engines and other heat engines, etc.

Such movements of the shipbuilders and marine engineers with their enormous capital and equipments, are surely a great menace to land engineers, yet it has been an unavoidable measure. Such enterprises are often entirely profitless yet it was imperative to carry on in view of keeping the works running and to prepare for the revival of this important national industry when the tide changes.

One of the most remarkable examples is that of the Mitsubishi Kobe Works which has started to produce motor vehicles and light oil engines. This will soon cause serious competition with other pioneer manufacturers such as Ishikawajima Dockyard, the Tokyo Gas and Electrical Engineering Company, as well as with foreign manufacturers.

Also, it is seen as a utopean idea that Manchuria may become in the near future a good market for such productions in case an Independent State in North China is constituted on sound economic standards and new traffic systems are constructed in these districts.

The movement of marine Diesel engine manufacturers for the cultivation of "shore" markets has been very remarkable. Various builders have carried out exhaustive tests and painstaking trials, and now such an experimental epoch having passed a remarkable development and energetic competition for land Diesel engines will surely take place this year among many marine and land engineers. Further, the gold embargo increases the price of imported engines, so that Japanese engineers stand in a quite advantageous position.

The demand of various land establishments such as spinning mills, flour mills, chemical works, workshops, etc., is for Diesel engines of a medium output ranging from 500 to 3,000 b.h.p., for which Mitsubishi Works, Mitsui Tama Works, Yokohama Dock Company, Kawasaki Dockyard, Kobe Steel Works, Niigata Iron Works, Ikegai Iron Works, etc., can offer quite an efficient installation with their substantial experience.

The natural increase of customs duty due to the difference of exchange rates combined with the original high price of foreign made machinery has given a fatal blow to foreign manufacturers, including Krupp, M.A.N., Bentz, Ruston-Hornsby, Junker, S.L.M., as well as Sulzer, Vickers-Armstrong, B. & W., Doxford, Hesselman's, etc. Against such difficulties, these manufacturers abroad are endeavoring to find a market for engines larger than 3,000 b.h.p. or smaller than 500 b.h.p. Leading Japanese engineers, however, have now succeeded in building either very large units or smaller types to the entire satisfaction of customers except some special types of light oil engines, and each firm has its own specialities.

It is true that high speed Diesels and gasoline engines have not yet so well developed in Japan as heavy oil engines. In this connection, foreign manufacturers may still have a room to operate, but it should not be overlooked that the Ikegai Iron Works have recently succeeded in manufacturing high speed Diesel engines for marine and land purposes, whilst the Mitsubishi Air Craft Company is manufacturing high speed and light Diesel engines for aircraft. Several other works are now making smaller Diesel units or light oil engines of various types for both marine and land uses, and it is expected a further development of these types with take place this year.

The combined efforts of the marine and land engineers of Japan have now succeeded in a great degree in checking the importation of foreign-made machinery, as an indirect or rather incidental result of the mutual competition among Japanese manufacturers. This is, however, a domestic affair, checking the outflow of the Japanese currency, so that the most important and necessary steps to be taken by Japanese engineers are to cultivate a new scope in the world's market and to prepare for international competition.

The activity of Japanese shipbuilders and marine engineers in the direction of general mechanical and civil engineering has become now an almost permanent enterprise, and will develop further until sight of a shipbuilding revival is very definite. Even then the majority of them will try to hold their new fields.

The geographical situation of Japan has made shipbuilding and marine engineering the most highly developed industries in Japan, whilst other engineering branches were still in their infancy and the division of work was not fully established. Therefore, the pioneer Japanese shipyards had to be completely self-contained, with all kinds of workshops, foundries, forges, test shops, laboratories, store houses, etc. for not only building ships, but also to make engines, boilers, auxiliaries, electrical machinery and all other necessary machinery and fittings of every description, so that it is not an exaggeration to call the shipyard a complete engineering kingdom where there is practically nothing that cannot be made if it is an engineering article. Yet shipbuilders, being terribly handicapped with the poor natural resources of Japan and the consequent high cost of materials together with high depreciation for equipment and the low efficiency of labor, have found themselves unable to compete in the world's shipbuilding market.

The characteristically self-contained system of the leading Japanese shipyards has rendered the transformation of their proper business to general engineering production much easier than in England or in some other countries. Besides, the influence of trade unions in Japan is not so strong as in other countries, particularly under such a merciless depression, and workers would rather engage in other trades than to become idle.

The first importance is, however, to find markets for the new productions after recasting of the shipyards. It would not be altogether impossible to cultivate further markets in China, Russia, Siam, India, Persia, Ethiopia, the South Sea Islands, South America, Mexico, Black Sea Coasts, etc., if the Japanese government or leading banks are willing to help the converted shipbuilders and marine engineers to set up a certain credit to customers in these countries in accordance with their purchasing or economic power.

It is, however, doubted that the Japanese government and capitalist will be plucky enough for such steps on a grand scale, still it would be possible that a reasonable quantity of Japanese engineering productions could be digested this year in the reconstruction of North Manchuria without interfering, even in the slightest degree with the Open Door Principle in China.

Some weak-hearted Japanese shipbuilders emphasize the necessity of the State's control of the shipyards, but such will not be the way for the sound development of this important national industry, whilst further perseverance and courage are highly needed.

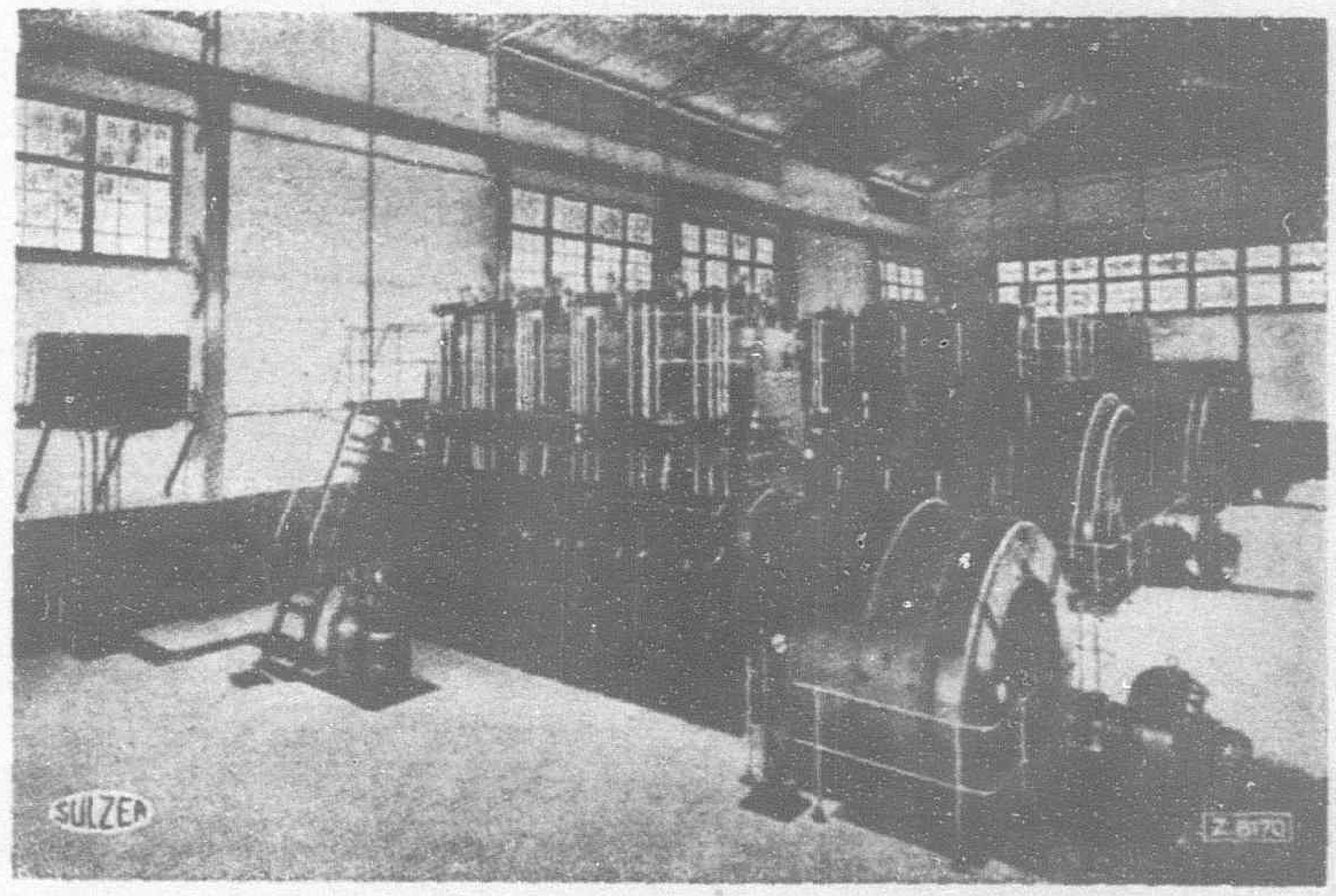
It should not be overlooked that shipping and shipbuilding do not always synchronize. Naturally, shipping being the origin of new shipbuilding requirements, both go on in parallel in the long run, but shipping activity does not mean always shipbuilding prosperity. In fact, the shipping trade is more speculative and has more artificial fluctuations than shipbuilding. The drop of "Yen" has made shipping of Japan much easier with a brighter prospect, but it compelled the increase of shipbuilding costs together with general living costs, which has rendered the shipbuilding situation worse.

The advantage in the exchange rate may cause activity in foreign trade and consequently in shipping, but if the cost at home rises to the same extent, there is no economic advantage, but only the national misery and poverty will remain as the result of the high living costs and the low value of currency.

Therefore, Japan is now faced with a great paradox, and the only way of navigating safely through the sea of economic and financial difficulties is to steer correctly and firmly with the combined efforts of statesman and the general public.

Diesel Electric Power Station in Magelang, Java

The power station in Magelang, which was originally equipped with two 500-b.h.p. Sulzer four-cylinder four-cycle Diesel engines, has recently been extended by the erection of a 1,000-b.h.p. Sulzer airless-injection Diesel engine. Magelang is situated about 1,300-ft. above sea level, in the midst of extensive sugar-cane plantations. Sugar-making itself requires no power from outside sources, since the ampas obtained from the cane after the juice has been pressed out, can be used as boiler fuel and raises sufficient steam. The Diesel engines, which are coupled to AEG-flywheel generators, therefore, serve almost exclusively for supplying light to Magelang and district. The new 1,000-b.h.p. Diesel engine, shown in the foreground in fig. 30, runs at 214 revs. per min., whilst the two engines first installed run at 375 revs. per min.



Electricity works, Magelang, Java; three Sulzer four-cycle Diesel engines totalling 2,000-b.h.p.

When the power station was extended, the electricity company decided to extend also their power stations at Pekalongan and Tegal, by installing a Sulzer Diesel engine of the same type and of the same power in each of them. By having all three engines of the same type and size, the stock of spare parts can be much reduced.

The Steel Industry of Japan

A SURVEY

By HAROLD HUGGINS

(Continued from January, 1932, Number)

The total production of bars at the Yawata Steel Works in 1930 was:

Round Bars	83,384 kilo tons	(P. 76)
Square Bars	23,988	(P. 78)
Flat Bars	45,308	(P. 79)
Miscellaneous	231	(P. 80)
Total	152,933	

Private Manufactures of Bars

Large as this total of bar production at the Yawata Steel Works is, it is far surpassed by the production of the private makers. This in 1930 totalled 277,924 kilo tons. These are again the totals of the figures published monthly by the Yawata Steel Works, Department of Investigations, but the same Department's total for the year is 272,301 kilo tons.

This production (from the monthly figures) for all kinds of bars was:

Round Bars	259,951 kilo tons
Square Bars	5,143 ,,
Flat Bars	12,830 ,,
Total	277,924 kilo tons

The total production of all kinds of bars in the private steel mills the past three years was:

1930	278,019 kilo tons
1929	387,679 ,,
1928	345,755 ,,

Angles

The domestic production of angles in 1930 was almost sufficient to meet the total demand. Only 8.1 per cent of the total production of 182,484 kilo tons was imported: that is to say, of the total demand for 1930, 7 per cent, or 14,918 kilo tons, was imported. In this item too, the Japanese makers have so increased their efficiency that imports are almost at an end.

These percentages are almost the same as in the case of bars. Imports were 8 per cent of the total production of bars: and 7 per cent of the total supply.

The total production of angles in 1930 was 182,484 kilo tons. Of this Yawata Seitetsu Jo (Yawata Steel Works) produced 89,263 tons and the private makers 93,221 tons.

The principal makers of angles are:

1. Yawata Steel Works.
2. Nihon Kokan K.K.
3. Tokai Kogyo K.K.
4. Sumitomo Shindo Kokan K.K.
5. Tokyo Kozai K.K.
6. Kobe Seikojo K.K.
7. Kamaishi Kozan K.K.

Of these the Yawata Seitetsu Jo (Yawata Steel Works) is the principal maker. All the large sizes are made by Yawata Steel Works only. Nihon Kokan, though, has recently begun to make sizes 3-in. by 4-in., 3-in. by 5-in., 3½-in. by 5-in. There are no agreements to cover this, though an association to regulate sales, production and prices, to cover small and medium sizes was organized in March, 1931.

Yawata Steel Works

Production of equal leg angles at Yawata Steel Works of all sizes for 1929 and 1930 was 53,479 and 60,695 tons respectively.

Production of angles of unequal legs at Yawata Steel Works in the same years was 41,698 and 27,902 tons, a grand total of 95,177 and 88,597 tons.

The figures for the production of angles by private steel makers during 1929, 1928, taken from *Kozai Nenpo*, June, 1930, are:

Nihon Kokan K.K.

Production of all kinds of angles in 1928 and 1929:

Kilo tons	*50 m.m. and under*	*100 m.m. and under*	*100 m.m. and over*	*Total*
1929	—	67,431	281	67,712
1928	—	54,862	7,719	62,581
1927	525	30,600	8,177	39,302

Tokai Kogyo K.K.

Production of angles in 1929-1928-1927;

	50 m.m. and under	*100 m.m. and under*	*100 m.m. and over*	*Total*
1929	—	25,438	—	25,438
1928	—	29,464	—	29,464
1927	—	21,064	—	21,064

Sumitomo Shindo Kokan K.K.

Production of angles in 1929-1928 and 1927:

Kilo tons	*50 m.m. and under*	*100 m.m. and under*	*100 m.m. and over*	*Total*
1929	—	557	—	557
1928	9	183	—	192

Kobe Seikojo K.K.

The Kobe Seikojo only began to produce angles in 1929—production was 232 kilo tons of sizes below 50 m.m.

Kamaishi Kozan K.K.

Produced no angles in 1927 and 1928, in 1929 only 141 tons of sizes below 50 m.m.

Imports of Angles.—Imports of angles, all sizes in 1930 were 14,918 kilo tons.

Channels and I Beams (Structural Shapes)

The Nihon Kokan is the only private steel maker producing either channels or I Beams. There are no figures published showing this production.

Total production of both articles in 1930 was confined to the Yawata Steel Works. The production for 1930 was:

Channels	38,913 kilo tons
I Beams	27,998 ,,

Total supply of I Beams in 1930 was 33,537 kilo tons, and of channels 48,934. The differences between Yawata production and the total supply was made up by imports.

Imports of Channels.—Imports of channels are not itemized according to country of origin. The total imports have been:

1930	10,021 kilo tons
1929	10,751 ,,
1928	9,447 ,,

I Beams (Structural Shapes).—Production of I Beams is confined to Yawata Steel Works. In 1930 production amounted to 27,998 kilo tons, in 1929 to 25,225 kilo tons and in 1928 to 27,332 kilo tons. Demand seems to be about steady. There was though a great fall in imports between 1929, when they were 26,056 kilo tons, and 1930 when they fell to 5,539 kilo tons. The total supply was: 1930, 33,537 kilo tons; 1929, 51,281 kilo tons, and in 1928, 41,701 kilo tons.

IMPORTS OF I BEAMS.—Imports of I Beams in 1930 were 16.5 per cent of the total supply. In 1929 imports were 50 per cent of the total supply. In 1928, they were 34.4 per cent of the total supply. Imports by country of origin are not itemized separately.

Total imports have been:

1930	5,539 kilo tons
1929	26,056 ,,
1928	14,369 ,,

Steel Tubes

Production of steel tubes in Japan is confined to the Nihon Kokan K.K., and the Sumitomo Shindo Kokan K.K. Production in 1930 was 88,338 kilo tons, in 1929, 76,269 kilo tons, in 1928, 64,460 kilo tons.

Imports which were the principal source of supply before 1924 have declined to a point where they are only about one-fourth of the total annual supply.

Of the two companies producing steel tubes, Nihon Kokan from the point of production is the more important. Sumitomo Shindo Kokan is the more sound financially.

Skelp

In 1929 the Yawata Steel Works began making skelp for welding in other mills. No details of the amount produced are obtainable. Nihon Kokan, in February 1931 began manufacture of skelp for tubes of one inch or less diameter, production in February 1931, the first month of operation was 1,000 tons. Capacity production will be 2,000 tons a month. No other mills are rolling this material, and the welding is done almost exclusively by Nihon Kokan and Sumitomo Shindo Kokan. Though it is reported that the Yokohama Dockyard Co., Ltd., is equipped for this purpose.

KIHON KOKAN K.K.

This company's rated capacity for tube production is 66,000 kilo tons. Production the first half of 1930 was 41,004 kilo tons. Production since 1925 has been.

Year	*Production, kilo tons*
1925	27,433
1926	32,699
1927	37,025
1928	53,321
1929	62,310
1930: 1st half	41,004

SUMITOMO SHINDO KOKAN K.K.

This company has a rated capacity of 25,000 tons of steel tubes a year. Production the first half of 1930 was 6,701 kilo tons. It owns two mills but the so-called Tube Mill, in Osaka, has been closed down since 1927, and the tube rolling equipment transferred to the Amagasaki Mill.

Production since 1925 has been:

Year	*Amagasaki*	*Tube Mill*	*Total*
1925	6,020	2,807	8,827
1926	6,708	—	9,810
1927	9,362	4,104	13,466
1928	11,139	—	11,139
1929	16,183	—	16,182

The total production of tubes in Japan since 1925 has been as follows:

1925	36,240	1928	74,460
1926	42,509	1929	78,492
1927	50,491	1930	88,338

IMPORTS OF STEEL TUBES.—In a total supply of 116,539 kilo tons in 1930, imports were only 28,201 kilo tons, 24.2 per cent. In 1929, total supply was 139,318 kilo tons, imports, 63,049 kilo tons, 45.2 per cent of the total. In 1928, supply was 119,319 kilo tons, and imports were 53,859 kilo tons, 45.5 per cent. It seems definitely established that imports of steel tubes will hereafter show a steady decline, as the Japanese industry increases its equipment and efficiency.

Rails and Accessories

There are only three makers producing rails and accessories in Japan:

1. Yawata Steel Works
2. Nihon Kokan K.K.
3. Tokai Kogyo K.K.

Of a total production of 259,335 kilo tons of rails in 1929, Yawata Steel Works, produced 254,743 tons, Nihon Kokan, 1,255 kilo tons, and Tokai Kogyo 323 kilo tons.

The decision of the Imperial Japanese Government Department of Railways to use only Japanese made rails on the Government railways, has tremenduously stimulated the production of rails in Japan since 1926. Production figures since 1923 follow: Production of rails in Japan.

	kilo tons		*kilo tons*
1923	92,927	1927	169,032
1924	77,880	1928	199,252
1925	131,977	1929	259,455
1926	166,597	1930	286,226

Imports have fallen steadily, and both light and heavy rails find little demand from Japan any longer.

YAWATA STEEL WORKS

Only Yawata manufactures fish plates, and other rail accessories. The private companies roll only rails.

NIHON KOKAN K.K.

Production of rails in this company's mill has been steadily decreasing.

Year	*Kilo tons*	*Year*	*Kilo tons*
1923	9,438	1927	3,924
1924	10,273	1928	3,564
1925	12,122	1929	1,255
1926	6,446		

TOKAI KOGYO K.K.

Production of rails by this company is an unimportant item.

KYUSIU SEIKO JO K.K.

This company produced in 1929 some 3,034 tons of rails. No details are available.

No details of equipment are to be had, but the company has a capacity (not officially rated of ingots 90,000 kilo tons a year; bar mill products 90,000 kilo tons a year; plates and sheets 60,000 kilo tons a year.

Imports of rails in 1930 were:

Heavy rails.	5,421 kilo tons
Light rails...	6,835 ,,
Total	12,266 kilo tons

This is only 2 per cent of the total supply, of heavy rails, which was 259,776 kilo tons, and 17.6 per cent of the supply of light rails, which totalled 38,607 kilo tons. Of the total supply, 297,482 kilo tons, imports were only 12,257 kilo tons, or 4.1 per cent.

Imports of accessories were 887 kilo tons in 1930. This was 5.1 per cent of the total supply, 17,218 kilo tons.

Imports of rails according to country of origin were in 1929 and 1928 as follows:

Country of origin	*1929 kilo tons*	*1928 kilo tons*	*1927 kilo tons*
England	62	372	6,049
France	1,324	7,701	15,731
Germany	17,080	26,359	40,589
Belgium...	—	429	3,600
Austria	—	—	—
Holland	463	304	4,434
Sweden	—	—	2,768
United States	14,424	10,219	15,666
Others	132	68	19
Total	33,485	45,452	88,856

Wire Rods

There are only three steel makers producing wire rods in Japan.

1. Yawata Steel Works
2. Asano Kokura Seikojo K.K.
3. Kobe Seikojo K.K.

Total production in 1930 was 122,431 kilo tons; in 1929 it was 67,789 kilo tons, and in 1928, 57,589 kilo tons.

Imports during the same three years were :—

1930	69,684 kilo tons
1929	157,474 ,,
1928	172,644 ,,

Total supply was :

1930	191,115 kilo tons
1929	225,263 ,,
1928	230,233 ,,

In 1930, imports were 36.4 per cent of the total supply, but in 1929 they were 69.4 per cent. The fall in imports these two years is 52.3 per cent, which is a much greater decline than that in the total supply, which was only 17.8 per cent. The total decline in imports between 1929 and 1930 was 54.5 per cent and in supply of all steel materials 14.8 per cent. So it can be seen that the decline in the import of wire rods was exceptionally severe.

This condition is due, as usual, entirely to the fact that the Japanese mills are more and more determined to "roll their own."

YAWATA STEEL WORKS.

The Yawata Steel Works have a rated capacity for rolling wire rods of 60,000 tons a year. In 1930 production was 83,845 tons.

ASANO KOKURA SEIKO JO K.K.

Production of rods has been :

Year	*Kilo tons*	*Year*	*Kilo tons*
1918	1,589	1924	9,898
1919	1,526	1925	12,964
1920	6,969	1926	6,204
1921	15,631	1927	5,147
1922	12,902	1928	6,025
1923	18,007	1929	3,582

KOBE SEIKOJO K.K.

Production of wire rods began only in 1927, and has been :

1927	248 kilo tons
1928	795 ,,
1929	2,445 ,,
1930, 1st half year :	3,851 ,,

IMPORTS OF WIRE RODS.—Imports of wire rods as already shown are on the decline. In the first half of 1930, they were 38,612 kilo tons :

For the past three years imports have been :

1930	59,485 kilo tons
1929	157,474 ,,
1928	230,233 ,,

The table below shows the use of wire rods in the different industries, 1924 to 1928, inclusive.

	1928	*1927*	*1926*	*1925*	*1924*
Railways	3	10	1	4	173*
Construction	2,111	1,407	834	9,122	383
Shipbuilding	2	8	15	7	5
Machinery...	77,769	38,105	38,169	29,806	29,834
Gas, Water, and Petroleum	103	50	—	72	—
Mining	37	—	—	40	23
Others	22,148	19,277	24,186	18,787	6,226
Total	102,170	58,857	63,205	57,844	36,644

*Kilo tons.

To be Continued)

Junnosuke Inouye

(Continued from page 66).

with the other great leaders of international finance. Mr. Inouye as President of the Yokohama Specie Bank, Governor of the Bank of Japan, Head of the Japanese Group in the Consortium and Minister of Finance, came to typify not only Japanese business integrity and brains but the guarantor of Japan's good-faith in international political matters. By the very reason of his position he became the outstanding figure in Japan in the eyes of the world, one in whom all could place their confidence and trust.—G.B.R.

While Moscow Laughs

(Continued from page 64)

protect itself; if Japan is forced to withdraw from Manchuria by the pressure of the League and the United States; will the League and the United States guarantee her security against the menace that is daily growing more imminent in Central Asia and Siberia? Can, or will, the United States and the League guarantee that Soviet Russia with its army of a million men and its Mongol allies make no further advance in the direction of China or Manchuria? Russia is not a Member State of the League. She is not a signatory to the Nine Power Pact. Russia signed the Kellogg Pact, but the events of 1929 are sufficient to tell us that this toothless document will not deter her from taking action when her plans for the next amputation of China's territories are completed. In another year, in two years at the latest, Russia will make her next move. Who will guarantee Japan's or China's security when that time comes? Who can bring pressure to bear on Russia in Central Asia? Who can stop her armies using the Urga route to China and South Manchuria? Who can even know what is going on behind the screen in Mongolia and Central Asia? Will the United States send an army to Manchuria to safeguard China and Japan from this menace? The United States will not even enter into a security pact with France and as a consequence of our refusal, France has created her own security and in doing so brought about a situation in Europe that makes her to-day the strongest Power in the world.

The Treaties of Versailles and Trianon are now the law of Europe. Any tampering with these guarantees of peace; the creation of any precedent under which the League becomes an instrument for the revision of treaties extracted under duress, will start the armies of Europe once more on the march. The fate of France, of Poland, and the states of the Little Entente hinge on the preservation of the *status quo* created at Versailles. Any action taken at this moment that would even indirectly disturb the delicate balance of power created by France to preserve the peace of Europe, is a crime against Civilization and Humanity. China's insistence upon bringing the Manchurian issue before the League for adjudication, demanding the convocation of the Assembly and the imposition of sanctions against Japan, while refusing to negotiate and compound her differences with Japan alone, if complied with by the League, can have only one result. The League will perish and with it will go the hopes of a large part of the world.

We may be wrong in our estimate of the European situation, but not far wrong. There is sufficient evidence that Germany and her late Allies, together with their Latin sympathizers will vote for any League action that will create a precedent for revision of treaties signed under duress. There is evidence that Great Britain and the United States in their desire to re-establish Germany on a sound economic footing will similarly favor the establishment of such a precedent. The fight that France has waged for over a decade to attain her security in the face of America's refusal to subscribe to any pact of this nature and in which she has finally emerged victorious, will enter a new phase behind the screen of China's dispute with Japan. Unless France can continue to dominate the League Assembly and prevent this dispute over the validity of a treaty coming under its purview, her labors of the last ten years are in vain., The dispute between China and Japan will be converted into an issue between France and the Little Entente on one side, with Germany and her late allies and their Latin sympathizers supported tacitly if not openly by Great Britain and the United States on the other. The fate of the world hangs in the balance with Soviet Russia sitting on the side-lines watching her opportunity.—G.B.R.

Tokyo's Waterworks*

Equipment, Capacity, Cost and General Service

By *ZENJI HARA, Director Waterworks Bureau, Tokyo Municipality*

At present the Tokyo Waterworks supplies water to an area of about 8,000 hectares with a population of 2,094,000, including suburban supply; annual consumption increases year by year.

The fundamental project is a maximum daily consumption of 500,000 cubic meters, estimated to supply a maximum population of 2,600,000, or a maximum daily consumption of 185 litre per capita. It is proposed to complete this project by the fiscal year, 1934.

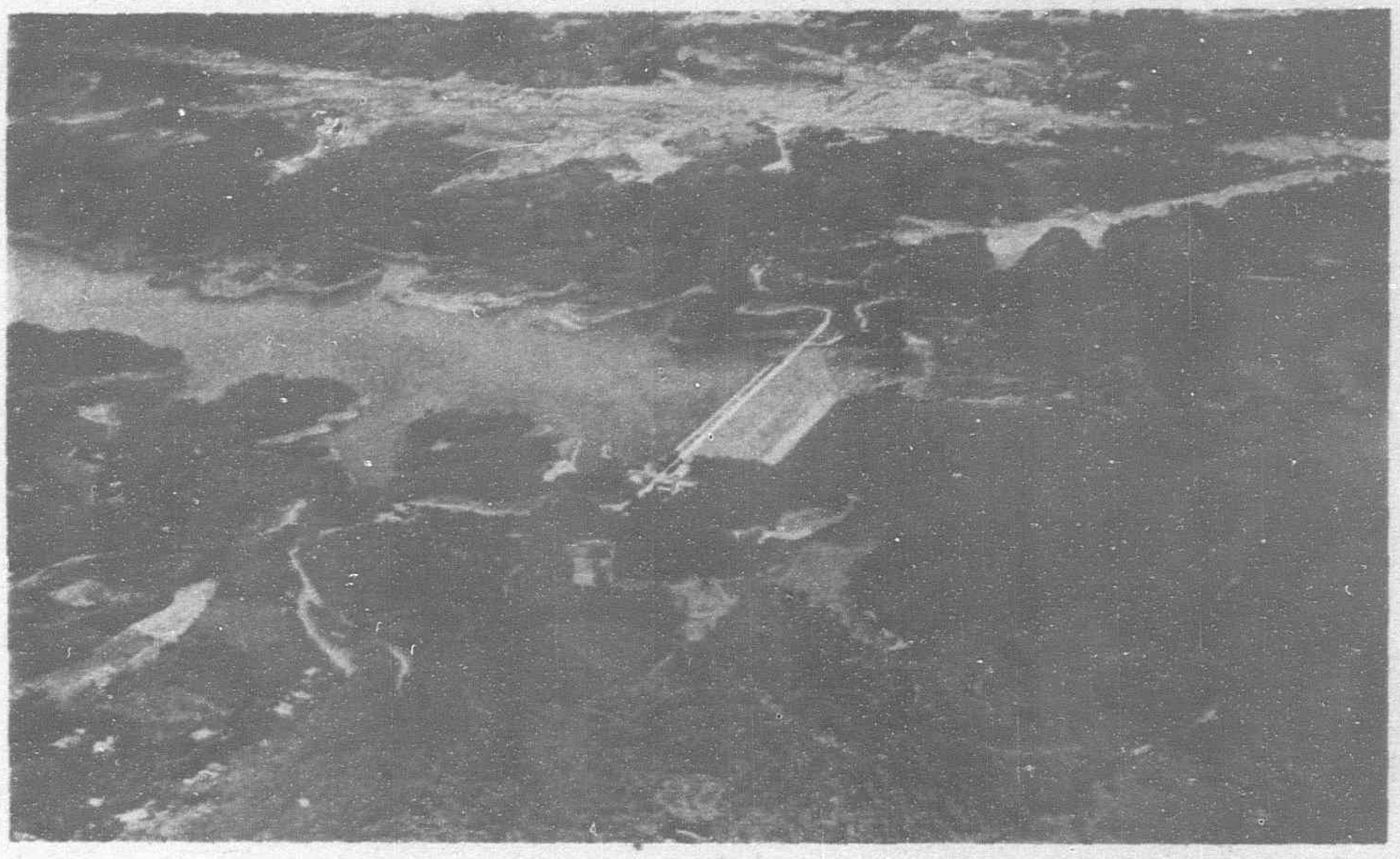
The cost from the beginning of construction up to date has been over Y. 50,000,000; and it is estimated that a total investment of more than Y. 76,000,000 will be needed by the time of completion at the end of the fiscal year, 1934.

The financial statistics, classified according to constructions during the last 39 years, are as follows:

Classification of construction		*Date of commencement*	*Date of completion*	*Expenditure Yen.*
Initial works . .		Dec., 1892	March,1911	9,188,672
Extension		Nov., 1913	March,1935 (will be completed)	
		Description in detail		
First term			March, 1913	35,511,291
Second term . .	In aid of national expenditure for reconstruction work.		March, 1915	5,252,669
	Municipal expenditure		March, 1918	24,642,000
Third term . . .			March, 1925 (will be completed)	1,650,000
Total				67,055,955
Grand total .				76,244,627

The source of water for the works is the river Tama where it collects clean river water by gravitation.

The area of the watershed is about 43,240 hectares extending over Tokyo and Yamanashi prefecture, of which an area of some 13,110 hectares is owned by the Municipality of Tokyo, and is maintained for preservation of water supply.



An Aerial View of Murayama Impounding Reservoirs (Upper Dam)

The intake is situated in the village of Hamura about 50 kilometers from the Civic center of Tokyo to the northwest, and the river water is diverted there and flows into an open supply canal.

The intake was designed to collect water to a maximum of 22.3 cubic meters per second. However, the river water decreases in seasons of drought, and so large reservoirs have been built, as extension works, to adjust the supply.

The current flow of the river Tama near the intake and water collected at the intake in the fiscal year 1928 were as follows:

	Cubic meters per second
Maximum current flow of the river	1,130.44
Minimum current flow of the river	3.77
Mean capacity of the Intake	83.48

The river water collected in the intake, flows through the Hamura-Murayama Line conduit, consisting of canal and tunnels, and arrives at Murayama containing reservoirs. From the reservoirs the water goes through the Murayama Sakai Line, by culvert type conduit, and arrives at Sakai-filter-station at which one part of the water is filtered and conveyed through the Sakai-Wadabori Line, culvert type conduit, and is stored in Wadabori service reservoir.

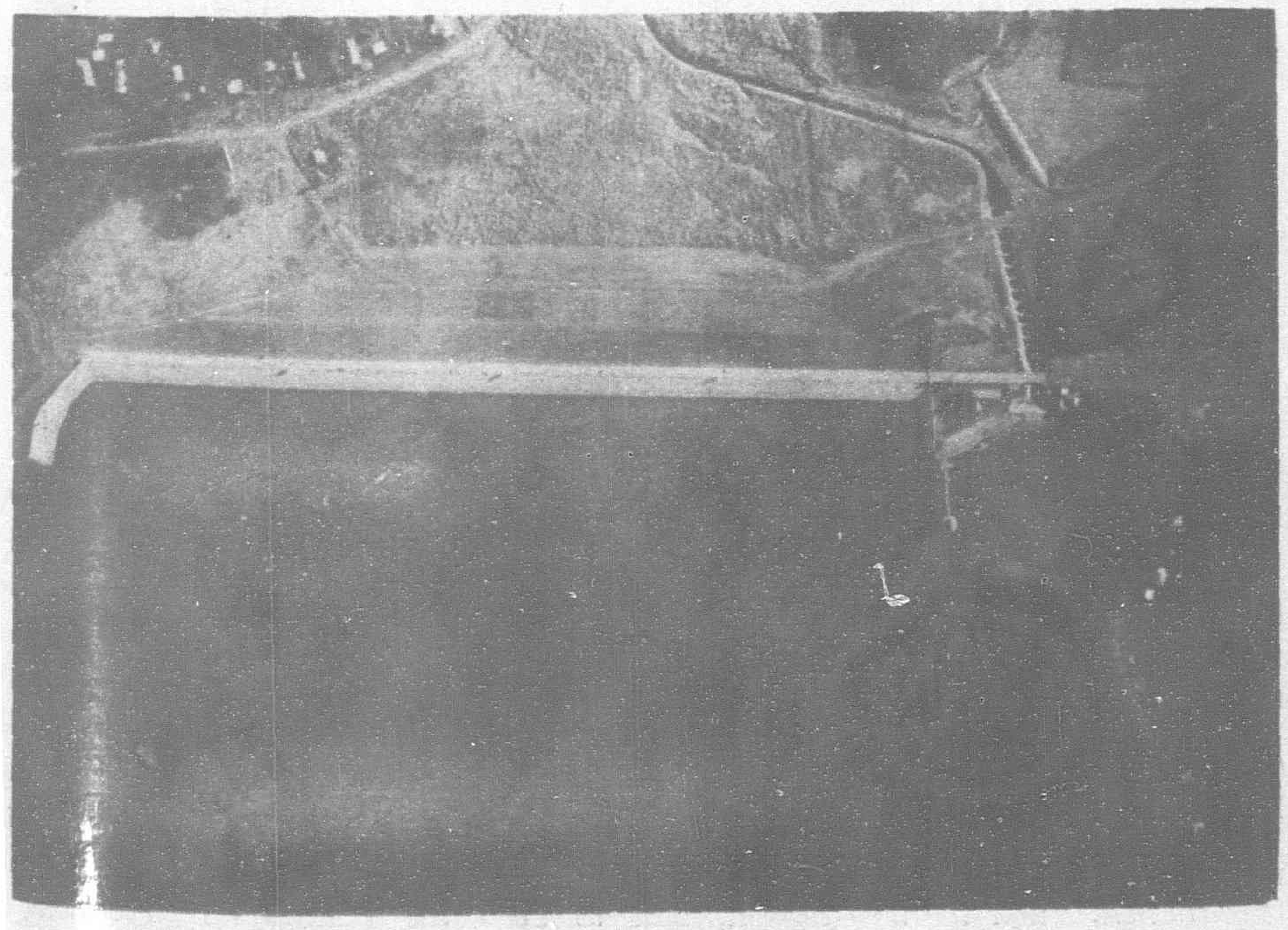
From here, by two 1,500 m.m. cast-iron trunk mains which lead to the city, water is directly supplied to the districts.

The other part of the water at Sakai filter station is turned into an open canal and comes to Yodobashi filter station. After being filtered at this station, the water is supplied to other districts by two 1,100 m.m. and two 800 m.m. cast-iron trunk mains.

The open canal, constructed in 1656 at the command of the Tokugawa Shogunate, was dug across the plain of Musashino, from Hamura to Yedo (as Tokyo was then called) about 39 kilometers in length, at great expense and requiring two years' labor. It was called Tamagawa-jôsuiro.

This supply line of the Tokyo aquaduct which connects Hamura intake and Yodobashi filter station was the only one until twenty years ago when the extension works were begun in 1911. These were partly constructed by 1918.

One part of this open canal (down-stream) is still in use as a raw water conduit from Sakai to Yodobashi, but after the completion of the culvert-conduit which is now under construction, it will be retained as a means of spare water supply.



An Aerial View of Murayama Impounding Reservoirs (Lower Dam)

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*Reprinted from the *Japan Magazine*

Classification, construction and length of conduits.

Name	*Class*	*Construction*	*Length meters*	*Remarks*
Tamagawa Conduit	Open canal	Open, dug canal	42,629	
Hamura-Murayama Line	Open canal and tunnel	Tunnel, horseshoe shape, constructed of concrete.	8,600	
Murayama-Sakai Line	Culvert type	Horseshoe shape steel plate, lined with concrete	11,255	No. 1, No. 2 and No. 3 torrent.
Sakai-Wadabori Line	Steel tube	Lined with concrete inside and outside.	10,757	Filtered water conduit
	Culvert type Steel tube	Horseshoe shape concrete. Steel tube lined with concrete inside and outside.	10,799	Raw-water conduit two-thirds of the total length not yet completed.

Reservoirs are constructed impounding a valley by means of two earthen dams one above the other, utilizing topographical features. The upper one is situated in what was the village of Imokubo, Kitatama county, and the lower one is in what was the village of Shimizu, Kitatama county.

These two reservoirs collect a volume of 12,355,000 cubic meters of water, and provide against drought.

Name	*System*	*Districts Supplied*
Yodobashi	Pumping	Yotsuya, Ushigome, Koishikawa and Hongo
Shiba	Gravitation	Kyobashi, Fukagawa and Honjo
Hongo	Gravitation	Shitaya, Asakusa and Honjo
Wadabori	Gravitation	Yotsuya, Akasaka, Azabu, Shiba, Kojimachi, Kyobashi, Nihonbashi and Kanda.

DIMENSIONS OF SERVICE RESERVOIRS

Name of Reservoirs	*Capacity*	*Dimension of Each Reservoir*					
		Length meters		*Width meters*		*Total depth meters*	*Effective depth meters*
		Top	*Bottom*	*Top*	*Bottom*		
Yodobashi 1	Total 27,826 Effective 17,976	76.73	76.12	109.09	108.48	3.88	2.67
Shiba 1	Total 27,826 Effective 37,447	66.50	65.95	94.11	93.20	5.09	3.88
Hongo 1	Total 27,826 Effective 17,447	66.50	65.95	94.11	93.20	5.09	3.88
Wadabori 1	Total 41,740 Effective 30,442	78.18	78.18	65.91	65.91	9.09	7.27
Total 4	Total 125,218 Effective 83,312	—	—	—	—	—	—

The delivery system and districts supplied from these service reservoirs are as under-mentioned.

CONSTRUCTION OF RESERVOIRS

Classification	*Dams*			*Water area sq. meters*	*Depth of water*		*Storage capacity*	
	Material	*Height meters*	*Length meters*		*The highest level meters*	*Effective level meters*	*The highest level cub. meters*	*Effctive level, cub. meters*
Murayama Upper Reservoir	Earth	16.67	1,455	406,179	12	10.5	2,982,402	2,699,200
Murayamo Lower Reservoir	Earth	27.17	2,071	1,016,595	18	15.9	9,934,203	9,655,800
Total	—	—	3,546	1,422,774	—	—	12,916,605	12,355,000

Note :—Near these reservoirs, on the north side, a reservoir with a capacity of 17,200,000 cubic meters is under construction as extension works, and it is called the Yamaguchi Reservoir. After completion of this new reservoir the total available capacity will be 37,555,000 cubic meters.

Four settling basins were built at Yodobashi filter station at the time of the initial works, and provide for sedimentation.

Number of Basins	*Total Capacity cub. m.*	*Dimension of One Basin*					
		Length meters		*Width meters*		*Depth meters*	
		Top	*Bottom*	*Top*	*Bottom*	*Top*	*Effective*
4	333,918	218.18	201.64	103.02	84.49	6.06	4.24

Their dimensions are as follows :

Twenty-four filter beds were built at Yodobashi by the initial works, and twenty are to be built at Sakai by the extension works, of which 15 beds have already been completed, and are in operation. The remaining 5 beds are under construction, and will be completed by 1935.

Dimensions of filter beds in operation are as follows :

Auxiliary collecting pumps and filtered water pumps :

As described above the Tokyo Waterworks collects water by gravitation and supplies most of the down-town parts of the city by gravitation, and to up-town parts by pumps.

But in the dry season, mostly in winter, the river water decreases seriously resulting in a shortage of supply. To remedy this, large impounding reservoirs were built at Murayama as extension works, but supply is still insufficient when dry seasons continued too long. Therefore, there are provided auxiliary collecting plants for temporary or emergency use. One is at Inokashira Pond, Toyotama county, which pumps up the water of that pond ; one is in Hamura near the intake and one is in Yodobashi station, both used to pump up ground water.

Number of Beds	*Total area (sq. meters)*	*Dimension of one bed*					*Thickness of one bed*						*Standard filtering speed for 24 (meters)*	*Total filter capacity in the fiscal year of 1928 (cub. meters)*
		Length meters		*Width meters*			*Sand and coarse sand*		*Gravel and pebbles m.m.*					
		Top	*Bottom*	*Top*	*Bottom*	*Depth meters*	*Below dia. 2.5*	*Above dia. 2.5*	*Dia. 25-30*	*Dia. 30 60*	*Dia. 60-90*	*Total*		
Yodobashi 24	95,526	78.18	77.57	50.91	50.30	2.73	697	121	Dia. 152	Dia. 152	152	1,274	3.03	68,830,256
Sakai 15: 12	56,156	86.67	86.36	54.24	53.49	3.03	788	121	Dia. 25-36 152	Dia. 36-60 152	303	1,516	3.03	66,171,052
Sakai 15: 2	9,360	86.67	86.36	54.24	53.94	5.03	909	61	Dia. 15-30 91	Dia. 30-60 152	152	1,365	3.03	6,016,471
Sakai 15: 1	4,680	86.67	86.36	54.24	53.94	2.85	909	61	Dia. 3-9 30	Dia. 9-15 30	Dia 15-39 61	Dia 30-60 1,091	3.03	
Sakai 15: Total	70,196	—	—	—	—	—	—	—	—	—	—	—	—	72,187,523
Grand Total	162,722	—	—	—	—	—	—	—	—	—	—	—	—	141,107,779

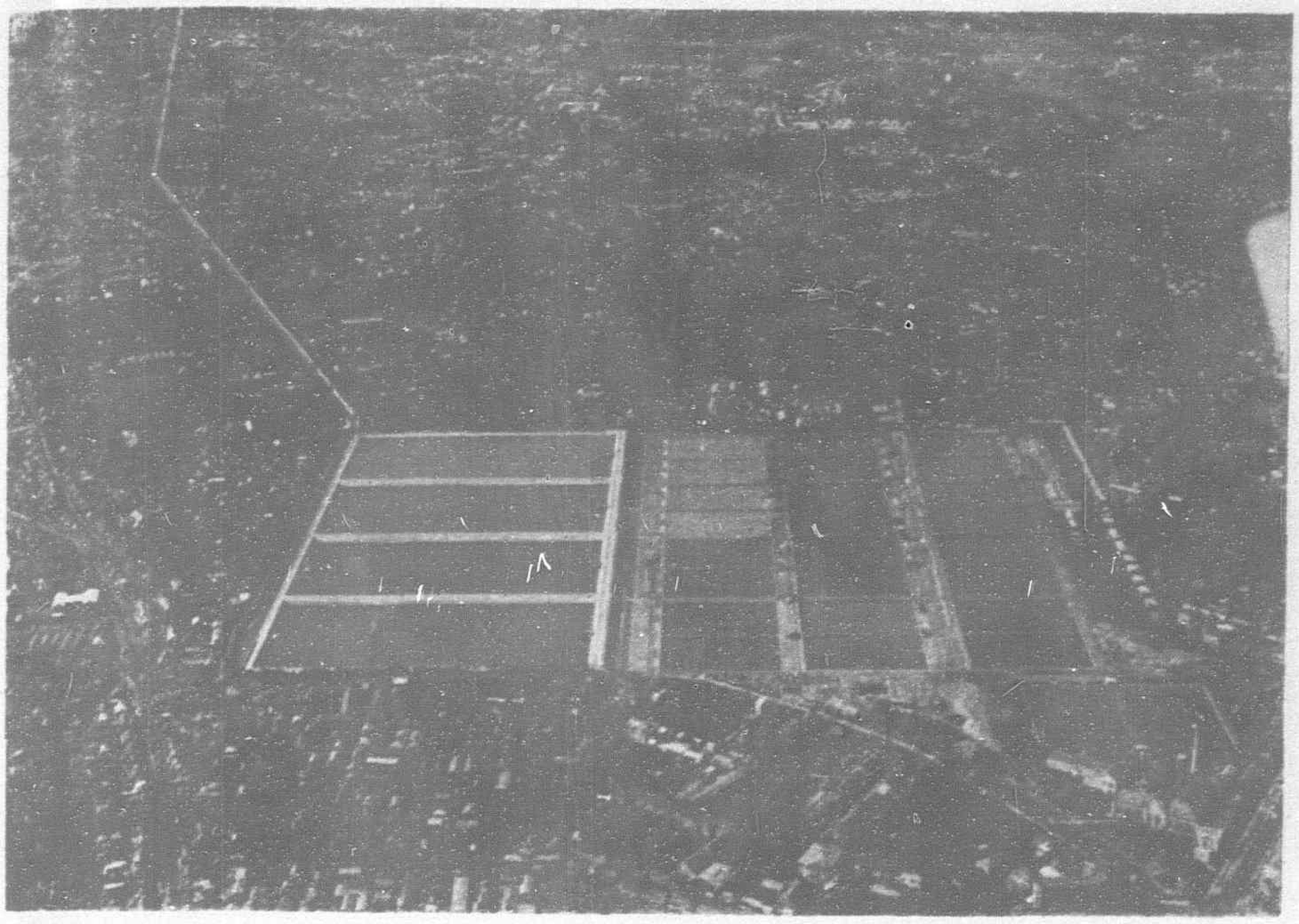
Three service reservoirs of equal capacity were built with the original works ; one is in Yodobashi filter station, suburbs ; one is in Hongo in the city, and one in Shiba, in the city.

Two service reservoirs, larger in capacity than the former, are to be built as extension works, partly in each of the two villages of Setagaya and Matsuzawa, both in Ebara county, and called Wadabori reservoir.

Of these two, one is rectangular in shape and has already been constructed and is in operation ; the other is under construction. Its shape is cylindrical, and it will be completed in 1932.

Filtered Water Pumps

By 1926, the extension work was completed, being equipped with six sets of steam pumps in Yodobashi filter station and directly supplying filtered water chiefly to the up-town districts or about one-third of the city. On September 1, 1923, pumps and pump houses were damaged by that dreadful earthquake and they needed immediate repair. To repair them, pumping operations had to be stopped, and to stop the pumps was a serious undertaking.



An Aerial View of Yodobashi Filter Station

An electric motor pump plant was newly designed and commenced work at Yodobashi in 1924 by the aid of national funds as a part of the city reconstruction work. It was completed in 1926. Immediately after these works had been completed, new pumps were set in motion and the damaged steam-pump plants were repaired and reserved for spare use.

The total length of cast-iron pipes, lying underground beneath the city, is over 1,286,619 meters, including 1,500 m.m. trunk mains and 1,100 m.m. mains, 800 m.m. sub-mains, and 100 m.m. service branches.

If this piping were laid along the main line of the Imperial Government Railway to the West, starting from Tokyo, it would pass through Kyoto and Osaka, crossing Moji Strait and at last comes to Omuta in Kyushiu.

	Meters.
Length of Mains	115,433
Length of Service Branches	1,171,186

PIPE MOUNTINGS

Sluice Valves	8,096
Air Valves	119
Public Fire Hydrants	6,989

The distributing rate of these fire hydrants is one to 11,499 square meters, in the city.

Number of water meters installed by the end of the fiscal year of 1928 totalled 164,070 and if classified by bores, they are as follows:

Diameter in millimeters	*Number*
12-13	145,200
16	6,804
20	3,574
25	4,722
30	432
40	493
50	85
75-80	321
100	314
150	79
200	18
250	3

Classified by Type:

Shape and type	*Number*
Single casing fan wheel shape of wet type...	2
Double casing fan wheel shape of wet type...	28,308
Single casing fan wheel shape of dry type...	130
Double casing fan wheel shape of dry type	131,715
Disc form of dry type	3,915

Collection, Storage and Filtration

1. Collection and Auxiliary Collection.—Water collected in the fiscal year of 1928 was 263,250,866 cubic meters and the range of variation through that year was as follows:

	Cubic meters.
Collected in maximum daily	1,652,918
Collected in minimum daily	222,394
Collected on the average daily	721,235

AUXILIARY COLLECTING PUMPS

Location	*Number*	*Name*	*Type*	*Prime mover*	*Output of prime mover kw.*	*Head*	*Capacity for 24 hours*	*Maker*
Yodobashi	2	Centrifugal	Single Horizontal	Electricity	46	13.6	19,200	Allen & Son Company, England.
Hamura	2	,,	,,	,,	45	10.6	24,000	Hitachi E. W., Tokyo.
Inokashira	4	Turbine	,,	,,	37.3	30	4,800	Ebara E. W., Tokyo.
Total	7	—	—	—	—	—	100,800	

ELECTRIC MOTOR PUMPS

Number	*Type*	*Motor output kw.*	*Head meter*	*Capacity for 24 hours cub. meters*	*Maker*
6	Single Horizontal	260	45.5	33,320	2 Ebara E. W., Tokyo. 2 Mitsubishi D. and E. W., Kobe. 1 Hitachi E. W., Tokyo. 1 Sulzer E. W., Switzerland.

STEAM PUMPS

Number	*Name*	*Type*	*I.H.P.*	*Head meters*	*Capacity for 24 hours cub. meters*	*Maker*
6	Worthington	Horizontal Duplex	306	70	28,000	4 Kawasaki D & E. W., Kobe. 4 Mitsubishi D & E. W., Kobe.

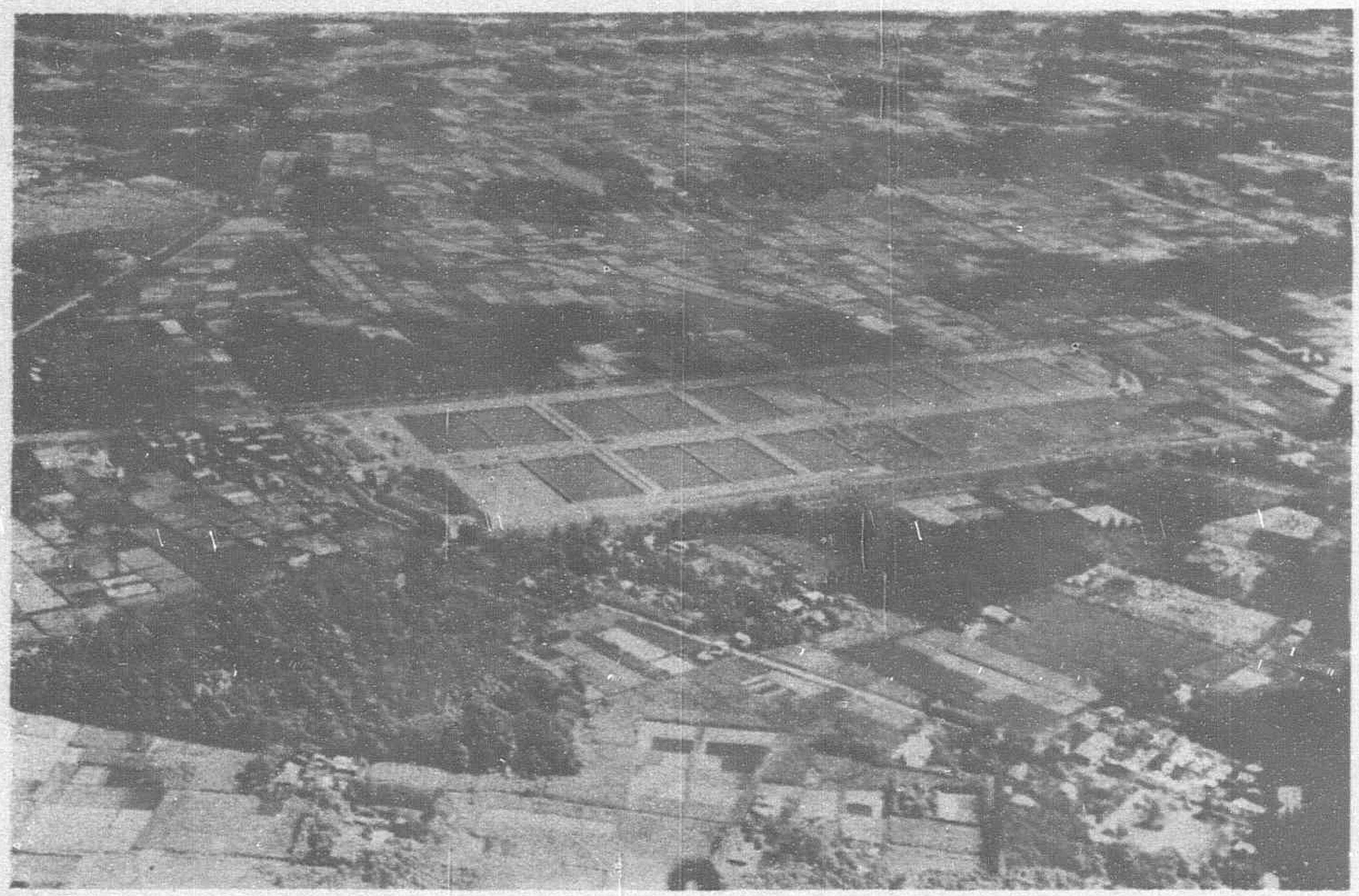
STEAM BOILERS

Number	*Name*	*Fuel*	*Working pressure Kg. per c.m. 2*	*Maker*
12	Lancashire	Coal	7.3	1 Shibaura E. W., Tokyo. 4 Ishikawajima S. B. & E. W., Tokyo.

In winter, when the river water of the Tama decreased, auxiliary collecting pumps were operated and the total complement volume of water was 4,433,082 cubic meters.

2. Storage.—In the fiscal year of 1928, in November water was impounded in Murayama reservoir, to a maximum of 13,681,808 cubic meters, and in August water was stored there to a minimum of 6,047,434 cubic meters. The total impounded water in that year was 121,319,304 cubic meters, and the monthly average was 10,109,942 cubic meters.

To keep the filtering speed of the water moderate the soiled sand on the surface of filter beds must be scraped off. The number of times that was necessary at Yodobashi and Sakai stations in



Aerial View of Sakai Filter Station

the fiscal year of 1928 was 357, and the total scraped area of beds was 1,514,487 square meters: the total scraped volume of soiled sand was 21,401 cubic meters while the total fresh sand restored was 24,162 cubic meters.

The total expense was Y. 73,329.13 for the year.

Volume of Treated Sand

Filter station	*Scraped cubic meters*	*Restored cubic meters*
Yodobashi	11,305	14,011
Sakai	10,096	10,151
Total	21,401	24,162

Water filtered in the fiscal year of 1928 was as follows:

	Cubic meters
Yodobashi Station	68,830,256
Sakai Station	72,187,523
Total	141,017,779

Comparing the above volume with that of the preceding fiscal year, the total increase was 6.9 per cent, 1.8 per cent in maximum and 9.2 per cent in minimum.

The average speed of filtration was 2.84 meters for 24 hours, through the fiscal year of 1928; the highest 4.65 meters and the lowest 1.19 meters.

Effective filtering hours numbered 737 on an average, the longest being 1,320 hours and the shortest 168.

Details are as follows:

Station	*Average speed of filtration for 24 hours, meters*	*Mean effective filtering hours.*
Yodobashi	2.21	765
Sakai	3.47	708

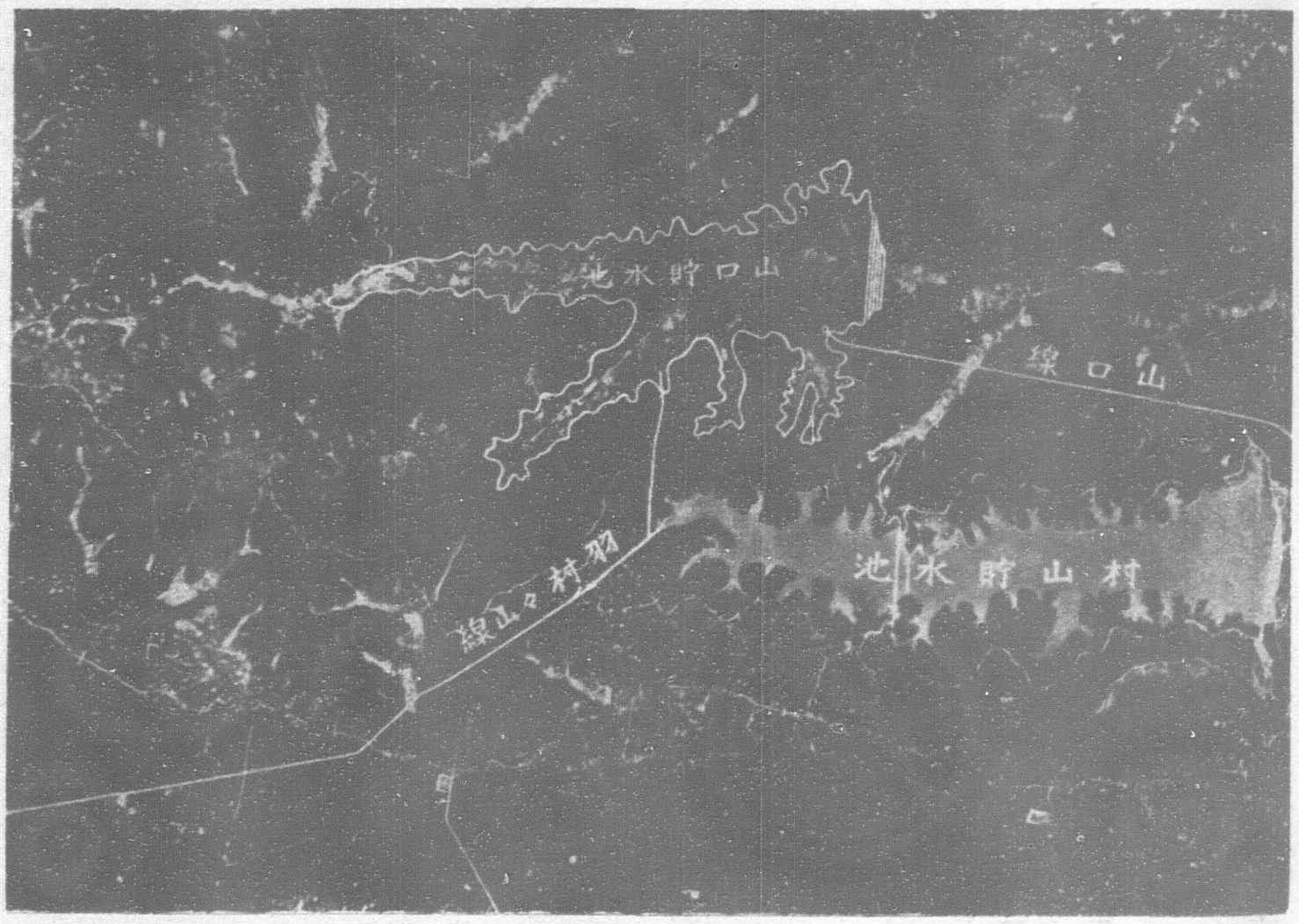
Sterlization

Apparatus for chlorination is installed both in Sakai station and Yodobashi station; and processes of sterilization are necessarily done especially when epidemics are prevalent.

Chlorination was done for filtered water at Yodobashi station from the 19th of January to the 25th of January and from the 30th of January to the 12th of February in the fiscal year of 1928.

It was also carried out at Inokashira pump station when the water of Inokashira Pond was pumped for auxiliary use.

Chlorous-calxes were five times poured into Murayama reservoirs to remove organic matter in the summer.



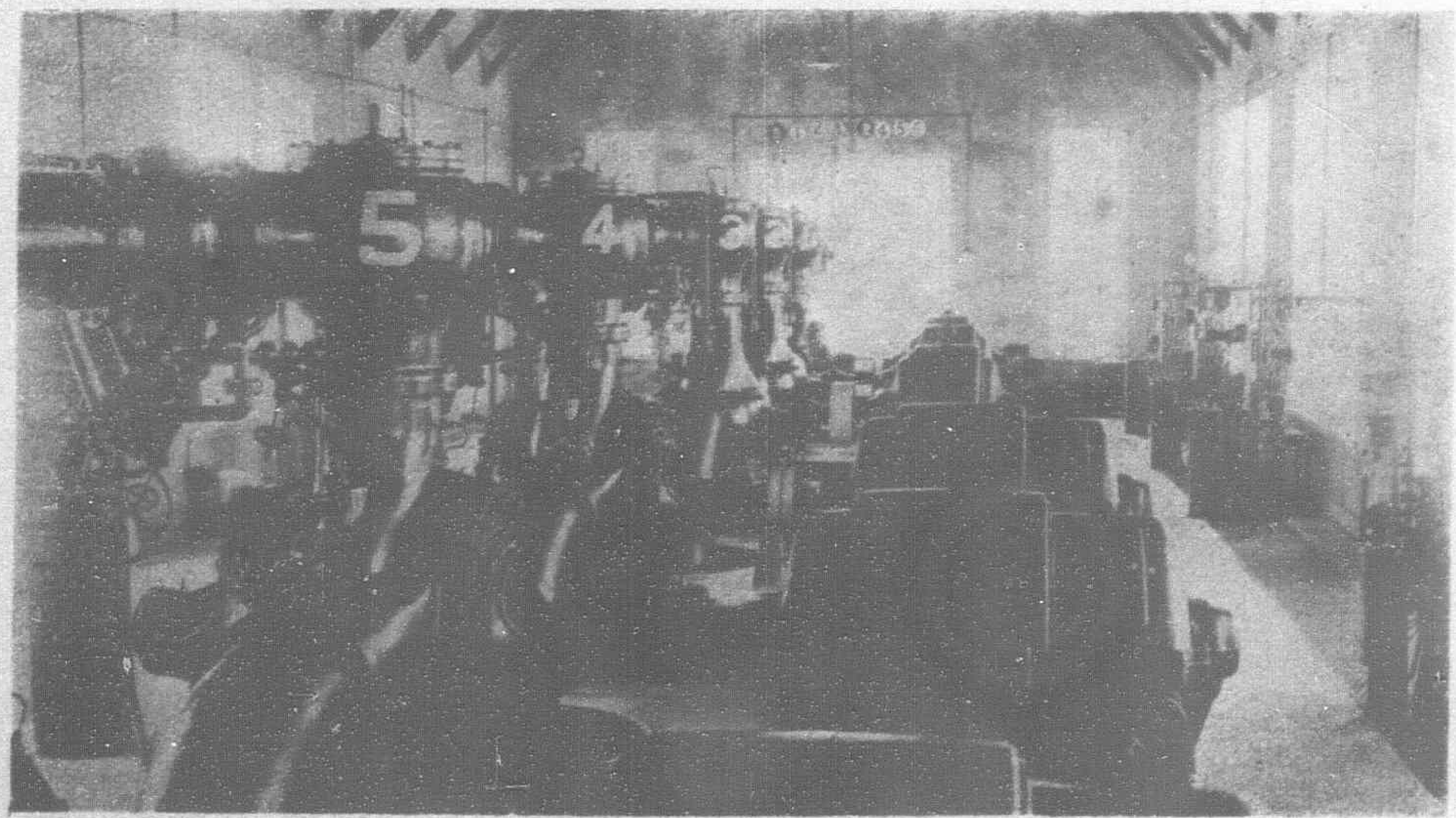
Yamaguchi Impounding Reservoir (upper) begun 1927 to be finished 1933, Earth Dam 110-ft. high. Murayama Reservoir (lower two)

A solution of copper sulphate was three times poured in winter at Murayama reservoirs to exterminate algae and other micro-organisms which would otherwise retard filtration.

The testing of the water quality is under the supervision of the Laboratory of the Tokyo Municipality.

Coagulation

On the 31st of June, 1928, there was heavy rain in the vicinity of the watershed of the Tama and an unusual flood ran down the river, which after the turbidity of the water continued unpleasantly for a long time, and necessarily checked the flow of water at the intake to Murayama reservoir. The stored water in the reservoirs was treated only at Sakai station. The turbid river water was directly conveyed through the Tamagawa open canal to Yodobashi station, and at the entrance of this station a



Pumping Station at Yodobashi 350 h.p. six sets, electric driven pump solution of sulphate of alumina was poured in until the turbidity decreased. The time spent for this coagulation was 17 from the 12th of August to the 7th of September, 1928. During the time or repairing the Hamura-Murayama Line tunnel, the river water of the Tama was directly led through that canal and the downstream became considerably muddy. At that time, also, coagulation took place at Yodobashi station from the 13th of February to the 17th of February, 1928.

The total volume of water delivered to the system in the fiscal year of 1928 was 139,492,902 cubic meters, an increase of 7.3 per cent above that of the preceding fiscal year; the increasing rate of consumption has been on an average of 10 per cent during the last 10 years.

Delivered in maximum daily	459,160 cubic meters
Delivered in minimum daily	311,677 ,, ,,
Delivered average daily	382,172 ,, ,,
Daily maximum consumption per person	227 litres
Daily minimum consumption per person	153 ,,
Daily mean consumption	185 ,,

CLASSIFIED BY PERCENTAGE:	*Per cent*
Yodobashi station	48.5
Sakai station	51.5
Classified by method :—	
Gravitation	84.3
Direct pumping	15.7

Cost per 100 cubic meters was on an average Y.0.0526, of which Y.0.045 is for labor.

The water delivered to the city by pumps in the fiscal year of 1928 totalled 21,842,318 cubic meters, and the electric power consumed to deliver it totalled 3,971,920 kilowatt hours; it delivered 59,842 cubic meters of water every day on an average, and consumed 1,818 kilowatt hours per 10,000 cubic meters of water. In summer when consumption increased, five pumps were driven at times to keep the water pressure sufficient; and there were 44 days when over five pumps were driven, in the fiscal year of 1928. In the preceding fiscal year there were only five days when five pumps were driven.

The mean working number of pumps through the fiscal year of 1928 was 3.8 a day.

There occurred no necessity to work steam pumps.

The water pressure in mains and branches has been recorded since the fiscal year of 1928, by the pressure recorders installed in the waterworks office and branch offices in the city.

Water pressure in every zone of the city on the 30th of April, 1930, was as follows:

WADABORI LINES
(gravitation)

Location	*Maximum*	*Minimum*
	(Kg. per sq.	*centimeters)*
Near Shiba service reservoir	2.6	1.8
Shirokane-daimachi, Shiba	2.7	1.4
Takanawa-minami-cho, Shiba	4.4	3.8
Honmura-cho, Azabu	2.4	1.9
In front of Aoyama Imerial Palace, Akasaka	2.0	1.5
Okido, Yotsuya	2.3	1.7
Fujimi-cho, Kojimachi	2.5	1.4
Marunouchi, Kojimachi	3.0	1.8
Kamakura-gashi, Kanda	2.6	1.3
Sumiyoshi, Nihonbashi.	2.3	1.1

SHIBA SERVICE RESERVOIR LINE
(gravitation)

Location	*Maximum*	*Minimum*
Akabanebashi branch office, Shiba	2.5	2.2
Tsukiji, Kyobashi	2.3	1.5
Tsukishima, Kyobashi	2.1	1.0
Matsui-cho branch office, Honjo	2.1	1.0

HONGO SERVICE RESERVOIR LINE
(gravitation)

Location	*Maximum*	*Minimum*
Yanagishima, Honjo	2.1	1.1
Mukojima-Susaki, Honjo	2.1	1.2
Eikyu-cho branch office, Asakusa	2.1	1.5
Okachi-machi, Shitaya	2.3	0.85

		Yodobashi System					*Sakai System*		
Water tested Items		*Raw water in open canal*	*Water in Settling basin*	*Filtered water*	*Water from a tap ¼ in the city*	*Water at the inlet and outlet of upper Murayama reservoir and at the outlet of lower reservoir*	*Water open canal*	*Filtered water*	*Filtered water at the outlet of the Wadabori service reservoir*
Number of Testing		25/51	101/202	80/1283	771/1540	48/48	25/15	26/669	26/51
Color	Maximum	3.0	3.0	—	—	—	—	—	—
	Minimum	—	—	—	—	—	—	—	—
	Mean	0.8	0.3	0	0	0	0	0	0
Turbidity	Maximum	25.0	27.0	—	—	38.0	12.0	—	—
	Minimum	2.0	1.0	—	—	—	1.0	—	—
	Mean	8.0	7.0	0	0	8.0	5.0	0	0
Odor..		None	,,	,,	,,	,,	,,	,,	,,
Reaction		Weak alkaline	,,	,,	,,	,,	,,	,,	,,
Chlor	Maximum	1.733	1.733	1.418	1.418	1.418	1.418	1.418	1.900
	Minimum	1.026	1.026	1.026	1.026	1.026	1.026	1.260	1.026
	Mean	1.416	1.380	1.294	1.289	1.375	1.348	1.314	1.304
Sulphuric acid		Trace	,,	,,	,,	,,	,,	,,	,,
Nitric acid		Trace	,,	,,	,,	,,	,,	,,	,,
Nitrous acid		Did not come out	,,	,,	,,	,,	,,	,,	,,
Ammonia		Did not come out	,,	,,	,,	,,	,,	,,	,,
Hardness	Maximum	2.160	2.030	2.030	2.134	2,212	2.212	2.030	2.004
	Minimum	1.775	1.775	1.725	1.775	1.875	1.775	1.800	1.775
	Mean	2.004	1.915	1.900	1.897	1.930	2.004	1.909	1.906
Total volume .... of solid matter ..	Maximum	76.000	78.000	69.000	74.000	85.000	75.000	64.000	75.000
	Minimum	60.000	44.000	49.000	50.000	58.000	57.000	51.000	51.000
	Mean	66.880	63.029	57.463	59.245	66.125	68.560	57.962	58.846
Consumption of .. potassium .. permanganate..	Maximum	6.220	11.069	2.765	1.233	6.952	3.081	1.925	2.212
	Minimum	1.020	1.051	0.711	0.632	1.185	1.422	1.027	0.948
	Mean	2.328	2.153	1.220	1.169	2.670	2.009	1.311	1.274
Bacteria colonies.. p. c. c.	Maximum	3.434	37.558	76	69	3.448	2.180	64	56
	Minimum	196	229	1	1	215	218	1	1
	Mean	696	1.108	6	12	710	564	7	9

Note :—(1) Figures in paragraphs of chlor, solid matter and consumption of potassium of permanganate are the weight in milligrams per litre of water
(2) Hardness of water is indicated by German method.
(3) In the column of number of testings, the figure above diagonal line is the number of times for chemical analyses, and the figure under the diagonal line is the number of times of bacteriological testing.

PUMP LINES (from Yodobashi)

Location	*Maximum*	*Minimum*
Takenodai, Ueno, Shitaya	2.8	1.3
Kamifujimae-cho, Hongo	2.7	2.0
Moto-machi branch office, Hongo	2.3	2.1
Otsuka, Koishikawa	2.3	2.0
Toyokawa-cho, Koishikawa	2.3	1.9
Toyama-cho, Ushigome	1.8	1.1
Tsurumak'cho, Ushigome	4.5	4.1
Kaguragashi, Ushigome	4.7	4.1

The purity of water being the most important problem for water supply, the Tokyo Waterworks always pays careful attention to it; river water, stored water, filtered water and running water from taps is tested bacteriologically and chemically in the Laboratory of the Tokyo Municipality every third day.

An example of the laboratory testings is as mentioned at end of previous page:

From January 1928 to December 1928.

In December, 1898, the Tokyo Municipality commenced supplying water by equipments of modern type; and since then over thirty years have passed. During that time the city has made rapid progress and the distribution of water has been greatly extended over the city, there having been 248,400 taps and 379,000 residences supplied just before the time the big earthquake and fire of September 1, 1923. By that calamity about 155,000 taps were damaged or burnt up. By utmost effort and exertion, they were restored or supplied; and the number of taps installed by the end of the fiscal year of 1928 represented a total of 285,745.

Domestic taps	259,590
Common taps	9,327
Special stop cocks	5,015
Private fire hydrants	1,329
Public taps	261
Taps in the suburbs	223
Total	285,745
Number of residences	338,249
Population	2,094,683
Metered taps	172,586
Unmetered taps	113,159

Requests to install meters are increasing year by year.

Residences supplied and consumers compared with the total residences and population respectively are:

Total residences	432,577
Residences supplied	336,371
Rate of providing	81.4%
Total population	2,218,400
Consumers	1,776,564
Rate of providing	80.1%

In the above comparisons, as it is considered that persons in offices, government or private, pupils in schools are duplicate consumers, half the number of persons in offices and half the number of pupils in schools are taken into account.

It is said that the quantity of water consumption is a barometer of civilization; the total draft through all taps and cocks in the fisal year of 1928 is recorded as 63,078,370 cubic meters, itemized as follows:

	Cubic meters
Domestic taps	56,798,477
Common taps	632,397
Special cocks	4,864,327
Private fire hydrants	2,562
Suburb consumption	770,607
Total draft	63,078,370

Average consumption per tap per month is as follows:—

	Cubic meters
Domestic	12
Combined, domestic and industrial	36
Government offices	267
Schools	583
Military barracks	3,473
Hospitals	443
Public baths	951
Common taps	619

The tap from which the largest quantity of water for a month was consumed in the fiscal year of 1928 is that installed in the Tokyo Imperial University, Hongo, which consumed 87,958 cubic meters per month; next is that in the Tokyo Fish Market, Kyobashi, and then that in Shinagawa Imperial Government railway station.

From the standpoint of draft, the fountains and recreation places stand first: consumption for a month on an average in Hibiya Park, Kojimachi, is 7,436 cubic meters, being first; and next is that in the Zoological Garden, Ueno, and that in Hanayashiki, Asakusa.

For industrial purposes combined with domestic use the Tokyo fish market, Kyobashi, in maximum, consumed 67,079 cubic meters for a month, and next to this was the consumption in Mitsukoshi Department Store, Nihonbashi, and next that in Shibaura Engineering Works, Shiba, and then that in the *Tokyo Asahi* newspaper office, Kojimachi.

Some towns in the suburbs of the city of Tokyo are supplied with water from the Tokyo Waterworks. They are Yodobashi, Sendagaya, Okubo and Tozuka. Besides these four towns, some particular buildings in the suburbs, such as the Military Hygienic Laboratory and so on, are supplied, numbering 37 in all.

Canton's Construction Program

U. S. Consul General J. W. BALLANTINE, Canton, China

The construction program of the municipality of Canton, China, for the fiscal year beginning July 1, 1931, as announced in the press, may be summarized as follows:

	United States currency
Road construction	$970,992
Port and wharf construction	385,000
Suspension bridge	165,000
Sewerage system	248,160
Public buildings:	
Schools	146,300
Other	167,200
Dwelling houses in special areas for the poor, etc.	96,800
Other	33,000
Total	2,212,452

The municipality has appointed a special commission to pass on plans for municipal improvements. It is the purpose to divide the city into 15 zones and to institute improvements in these zones successively. In the first zone on which work is to be started it is planned to provide for the construction of a number of avenues of a uniform width of 80 feet, flanked with 12-foot sidewalks and lined with shade trees.

Buildings over five years old are to be demolished or reconstructed within two years, so that all buildings in the zone may conform to the plan of the commission. Mortgages will be arranged by the municipality for property owners who lack the necessary capital to finance new construction. Each two years a new zone will be handled in the same way, so that the entire program will spread over a period of 30 years. It is planned to meet reconstruction expenses by loans, which it is thought can be raised so long as the program meets popular requirements.

In the city proper a total of 72,340 feet of road is to be constructed during the present year, in addition to a considerable program laid down for Honam Island and other suburbs.

The building program includes the erection of 100 dwelling houses for the poor and for people now living in boats; a new municipal building, which will require two years to complete; 24 public markets; four school dormitories and a manual-training school.

The new sewerage system introduced is expected to require three years for completion.

Port works at Chowtautsui (Honam Island) involve the construction of an embankment nearly a mile long to be completed within two years, of which 1,000 feet has been finished. Embankments are also being constructed along the western and middle sections of the Pearl River, and some of this work is already completed. Various wharves are being rebuilt. The suspension bridge across the Pearl River, which is being constructed by an American company, is expected to be completed by the summer of 1932.

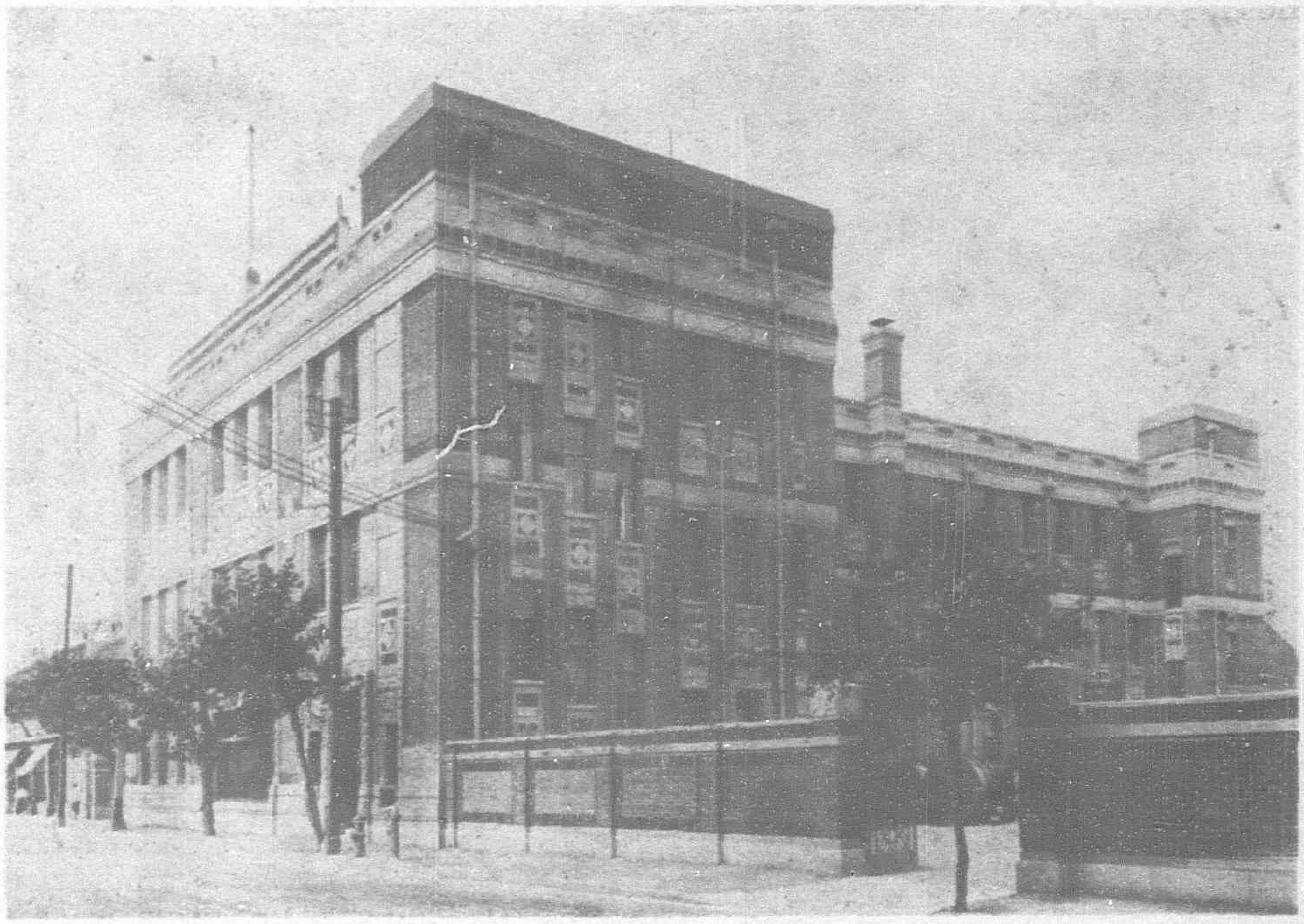
The Reconstruction of the Shanghai Telephone System*

By J. HAYNES WILSON, M.C.

COINCIDENT with the development of Shanghai it has been necessary to take steps to furnish the city with an up-to-date telephone system, and it is the purpose of this paper to indicate in a general way the means taken to do so.

Previous to August, 1930, plans were in existence to convert the telephone system to automatic working over a period to terminate in 1937, and some progress in this direction had already been made.

Approximately 972 lines were in operation in the Eastern area connected to an Ericsson automatic exchange, while some 8,216 lines were connected to a rotary automatic exchange in the Central District.



West Exchange Building—Medhurst Road

Equipment for two new exchanges, one of 4,000 lines in the French Concession, and for one of 5,000 lines on Fokien Road had been ordered, and suitable buildings to accommodate these were in the course of erection.

Due largely to the realization that the plans in existence would have to be speeded up to meet the demands of the increasing number of telephone users, and to the fact that very considerable capital would be necessary in order to carry out the conversion in a much shorter time than was at first anticipated, negotiations were initiated to obtain the benefits accruing from association with an organization having world-wide interests and experience in telephonic communication and operation.

After somewhat prolonged negotiations The Shanghai Mutual Telephone Company was taken over by the International Telephone and Telegraph Corporation and Shanghai Telephone Company came into existence. This Company took the work in hand on August 5, 1930, and gave an undertaking that within two years the Shanghai telephone system would be converted to automatic operation.

On December 13, 1931, 70 per cent of the Shanghai telephone stations were automatic and four new central offices were in operation, namely, Wayside, Pichon, Fokien and Montigny; two more central offices will be opened early in 1932, thus completing the undertaking except for extra Settlement lines, the conversion of which has had to be postponed for political reasons.

The completion of the programme is then within sight but has entailed immense effort.

The goal is to provide apart from an automatically operated system, a plant with sufficient flexibility to serve future possibilities and which can reasonably be expected to serve its full life.

Studies.—The studies covering estimated development—plant requirements, economic layout and so on, warrant detailed attention, hence it is proposed to pass over this phase of the undertaking and proceed to what must be a brief indication of the construction work done. It should, however, be mentioned that a large force of engineers has been engaged upon such studies in order to prepare the specifications necessary.

Man Power.—It became immediately obvious that the programme could not be put through without outside help and the International Telephone and Telegraph system was called upon for suitable specialists—assistance being required for planning, construction, traffic and commercial duties. Assistance arrived from all over the world—57 telephone specialists converging upon Shanghai from Great Britain, United States of America, South America, Spain, Japan, etc.

A new organization was built up and new labor recruited, resulting in an increase of staff employed by Shanghai Telephone Company from 3,180 to 4,137 persons within six months.

Buildings.—An early decision as to central office buildings was necessary and involved a re-arrangement of central office areas, the re-arrangement being influenced by existing offices, geographical considerations, political boundaries, the number of existing and ultimate subscribers, traffic requirements and the configuration of the existing plant.

Six new buildings have been erected, particulars of which are given in Table I.

TABLE I.—BUILDING PARTICULARS.

Exchange	*Building Capacity lines*	*Present Equipment lines*	*Building Started*	*Building Completed*	*Building Period*
Pichon ..	10,000	4,000	14 Aug. 29	1 Apr. 30	7½ months
Fokien ..	20,000	5,000	3 Nov. 29	4 Oct. 30	11 ,,
Wayside	10,000	5,000	21 Jun. 30	15 Dec. 30	6 ,,
North ..	20,000	7,000	15 Oct. 30	14 Apr. 31	6 ,,
West ..	20,000	6,000	26 Sept. 30	30 July 31	10 ,,
Montigny	20,000	6,000	15 Aug. 30	16 Mar. 31	7 ,,

The total floor space provided is 136,925 square feet, generous provision for the future being made as is indicated by the capacity of the various buildings compared with the present equipment: it is already necessary to increase the equipment in certain areas to meet growth requirements.

The size of a Central Office is not directly proportional to the number of telephones to be served, community interest having a strong influence. This is illustrated by the amount of equipment in the West and Montigny offices, each having a present equipment capacity of 6,000 lines.

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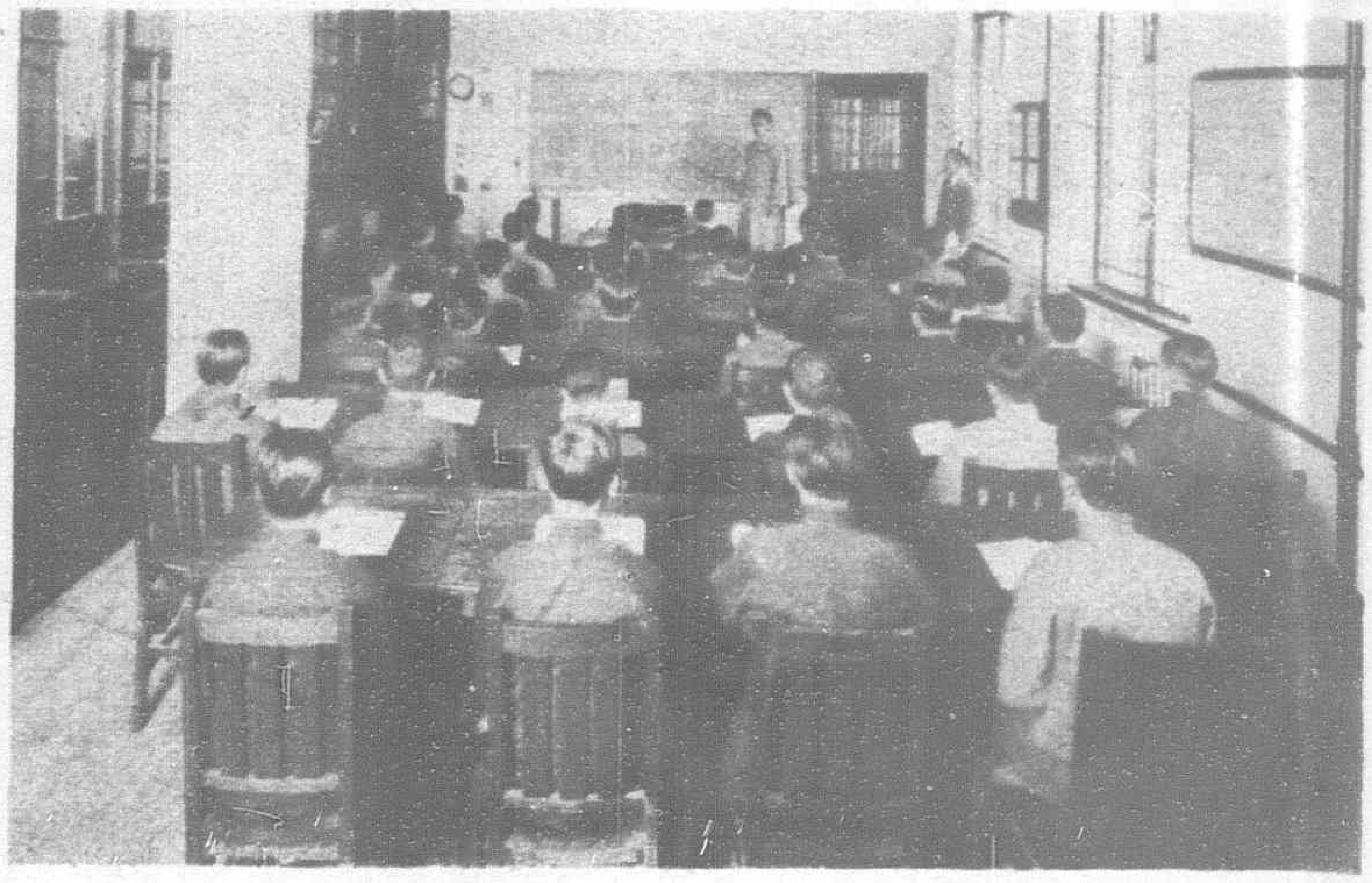
*Paper presented before The Engineering Society of China.

Cable Splicing School



Telephone Training School

West serves a residential and Montigny a business area. Table II shows the variation in the amount of equipment required.

TALBE II.—COMPARISON OF SWITCHING PLANT WEST AND MONTIGNY EXCHANGES.

Switch Group	*West*	*Montigny*
1st Line finders	600	960
Registers	60	110
1st Group selectors	300	585
2nd Group selectors (local)	95	150
2nd Group selectors (Incoming from other exchanges)	275	473
3rd Group selectors	352	606
Final selectors	432	610

Table III further demonstrates the variation of traffic giving the average number of calls originated per subscriber in various central offices during the busy hour.

TABLE III.—COMPARISON OF BUSY HOUR ORIGINATING CALLING RATES—ALL EXCHANGES.

Exchange Name ..	*Code Digit*	*Nature of Area*	*Originating Calling Rate Calls per line.*
Central	1	Business	2.58
Lucerne	2	Residential	1.04
West	3	Residential	0.86
North	4	Business	1.36
Wayside	5	Business	1.96
Pichon	7	Residential	1.23
Montigny	8	Business	2.08
Fokien	9	Business	2.41
		System Overall Average	1.79

Central Office Equipment.—The automatic equipment ordered was manufactured in Paris and Antwerp, the factories there being asked to meet a stiff schedule of deliveries. The results were gratifying in as much as the material arrived as required.

Installation of Automatic Equipment.—A contract was placed with the China Electric Company to install the automatic equipment.

In order to carry out the work in the required time, the China Electric Company proceeded to form an Installation Department that would be capable of handling many different classes of labour. The preliminary step was to arrange for experienced installing engineers to be sent from the various Associated Companies which already had similar departments formed.

Three London installers who had been engaged upon an extension to the existing Central automatic exchange were available in Shanghai and within six months from the contract being placed, fourteen additional experts arrived to assist in supervision and training. Of these, four came from Paris, six from Antwerp and one each from Cairo, Peru, United States of America, and Rio de Janeiro.

Pending the arrival of automatic equipment, steps were taken to train local help—Chinese students returned from United States of America, Russians and others were engaged for special work or junior supervisors. By good fortune several men were found who had performed duties in telephone exchanges in various parts of the world.

Men with some training in the use of tools were recruited and trained for special work such as erecting apparatus, running cables, simple wiring, switch adjusting and so on. The China Electric Company's factory in Chapei was called upon to supply as many trained wiremen as could be spared and additional assistance was given by Shanghai Telephone Company who sent men into each of the new exchanges during the installation period in order that they might become familiar with the equipment and thus be better able to maintain it after it was brought into operation.

Ordering of Supplies.—While plans were in the course of preparation, estimates were made of materials required and a schedule drawn up of delivery dates. This in itself was quite a study as the programme did not permit of any shortage of materials when the plans were ready. On the other hand care had to be taken that there would not be an undue surplus of material at the end of the job, and that unnecessary expense should not be incurred due to material lying idle pending use.

Major items such as underground ducts and underground cable could be estimated accurately, but aerial cable, suspension wire, distribution boxes, wire and a multitude of other miscellaneous items presented considerable difficulty. The preliminary step was to use prepared block plans of the town, study a number carefully and base further calculations upon data thus obtained.

Outside Plant Reconstruction.—A convenient manner of reviewing the activities involving tce distribution network as distinct from the central offices and equipment is to follow the course of a subscriber's line from a central office to the telephone user's premises.

Main Distribution Frame.—It is at this point that the connection between the exchange apparatus and the distribution network is carried out. Here the lines entering the exchange are sorted from geographical order to numerical order, and the arrangement is such that a subscriber's allocation outside the exchange can readily be rearranged when desired, as for instance, in the case of a subscriber removing from one part of the area to another.

On this frame also, protection is provided against lightning and power contact hazards for all subscribers' lines entering the exchange.

Cable Vault.—Entry to the central office is always effected by means of underground cables which may contain up to 1,200 pairs of wires. Subscribers and inter-exchange cables are concentrated in the cable vault, which is located immediately below and parallel to the main distribution frame. This vault is designed to facilitate tidy termination and to provide protection against fire or mechanical injury.

Since the street cables are of large size and are insulated with paper, they are not suitable for direct termination on the main distribution frame, and consequently it is necessary to splice these cables into a number of smaller cables which are insulated with silk and cotton ; this splicing is carried out in the cable vault.

The street cables leave the cable vault to feed the distribution network, and they radiate in all directions from the exchange through duct routes built up of 3, 6, 9, 12 or 15 ducts.

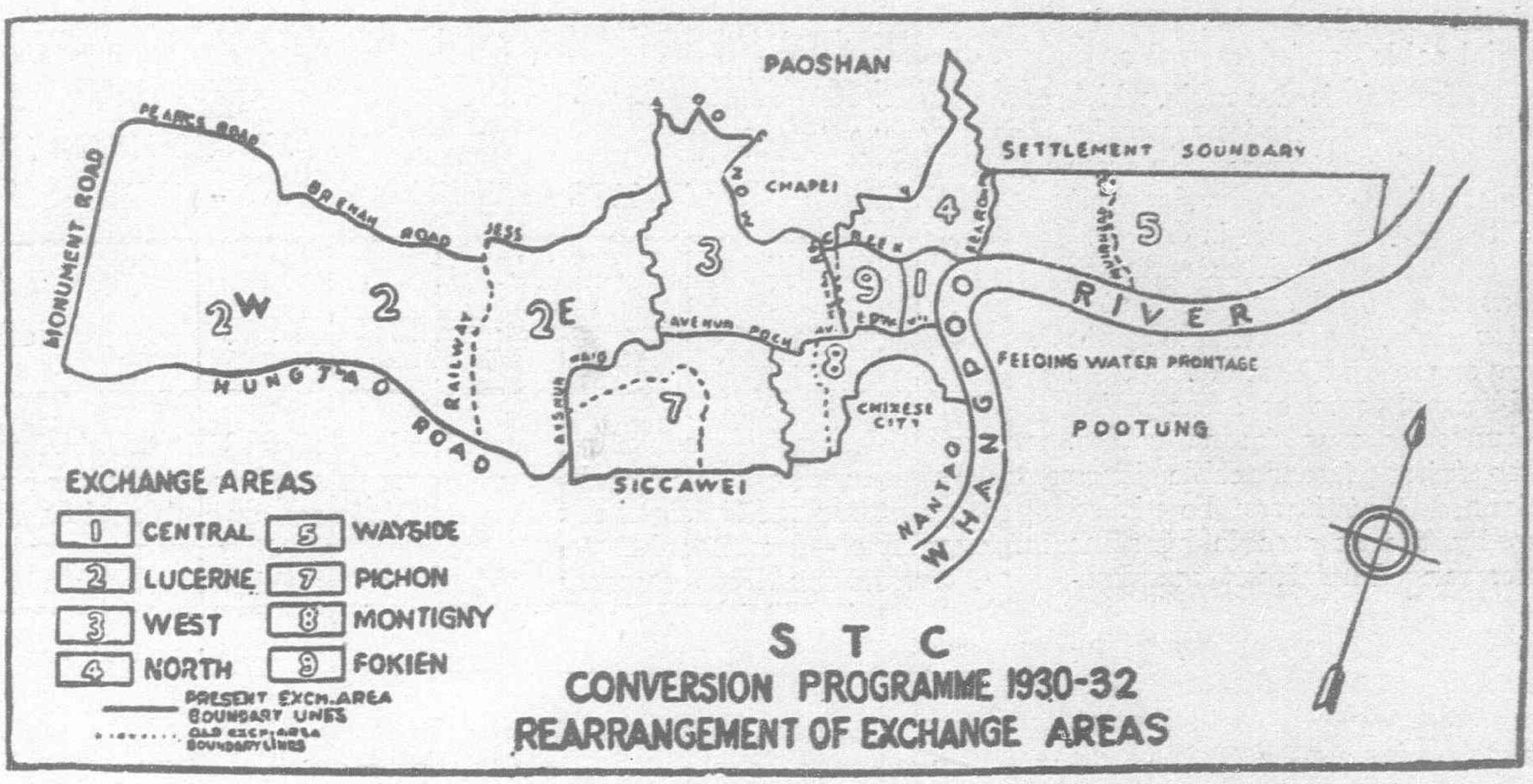


Plate No. 1

Ducts.—In addition to 340 duct miles which already existed in 1930, a total of 40 duct miles has been laid during the reconstruction period.

Concrete ducts, vitrified clay ducts, iron pipes, and in some cases fibre conduit have been used in this work; some of the ducts being manufactured in our own yards, while others were imported.

At intervals along the duct routes are wells or manholes, which, whenever possible, are constructed to certain standards which have been proved to be the most suitable for particular conditions.

In many cases the standard well could not be built due to what one might call the rather unsystematic arrangement of the pipes, drains, cables, etc., which were buried underground many years ago by the various Utility Companies and others, not excluding the Telephone Company. For example, in one particular case, it was necessary to sink a well 12 feet underground in order to clear a sewer.

When the work started cables were pulled through ducts by hand winches, but later by a winch designed and fitted locally on a Ford truck, and finally by a truck which was specially imported for this purpose; the mechanical means proving to be both speedy and economical.

Existing ducts were utilized to the greatest possible extent, in many cases small cables being replaced by large ones, this being possible due to development in cable design which now enables a 900 pair cable to be manufactured the diameter of which is not much greater than of a 300 pair manufactured some years ago.

In certain instances the old ducts were found to be full of mud, in order to clear out this accumulation the P. W. D., the Water Works Company and the Fire Brigade were called upon to assist in an experiment of flushing the ducts with water. This proved successful, it being found that 40 lbs. pressure of water cleared of obstruction approximately 100 yards of duct.

Splicing.—Mention has already been made of the wells or man-holes which are located at intervals of approximately 200 feet along the duct routes. These are used as jointing chambers, the cable being ordered in proper lengths according to the location in which it is to be used.

The splicing of cable in a man-hole requires a high degree of accuracy and skill, because each pair of wires must be connected in a pre-determined manner, and it is of the utmost importance that the two wires forming the pair for a telephone circuit must not be separated from each other, anywhere between the exchange and the subscriber.

The cable splicer spends a large part of his time in joining wires, one splice of 1,200 pair cable involving 4,800 wire ends or even more under certain circumstances. Within the last 18 months over 4,000,000 wire joints have been made in underground and serial cables.

The average time taken to complete a 1,200 pair splice is 24 hours and a 900 pair, 20 hours.

The work of splicing cables in man-holes is frequently handicapped by the presence of water and it is necessary to consider the tides at certain times of the year. In order to empty manholes Ford pick-up vans fitted with pumps have proved invaluable: hand pumps are found sufficient as a rule to keep down seepage. Wells must be kept as dry and as clean as possible while splicing operations are in progress, because the cables used are of the dry core, paper insulated type which demand a high degree of insulation, and to which dampness in any form is a deadly menace.

Upon completion of wire jointing, the cable splice is covered with a lead sleeve and is made watertight with a plumber's wipe.

Distribution.—The feeder cables already mentioned as radiating from the exchange, are each designed to serve a certain area, further distribution being carried out by smaller cables in three ways. (1) By being led under ground to a large building; (2) by cable placed on the walls of

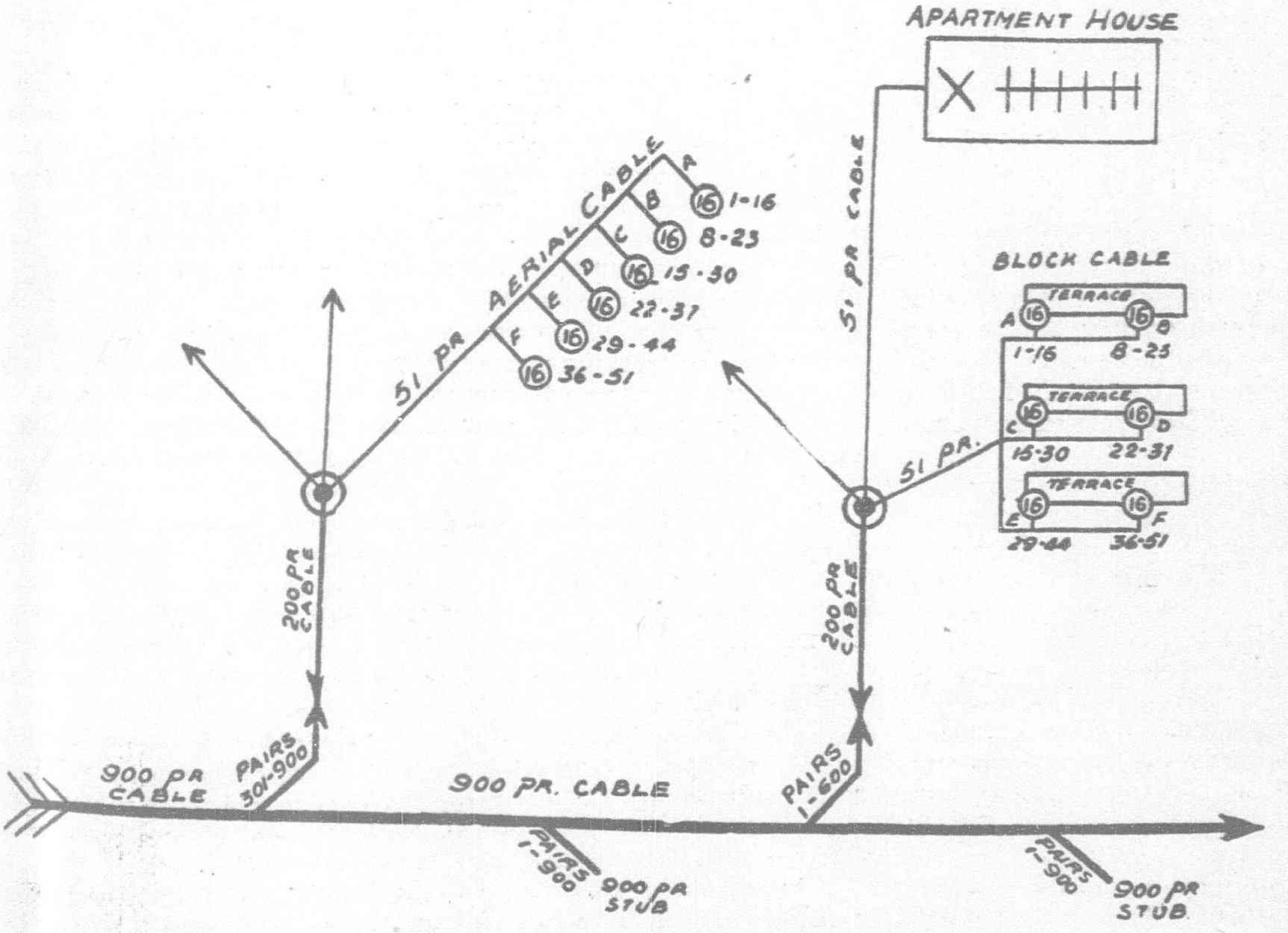
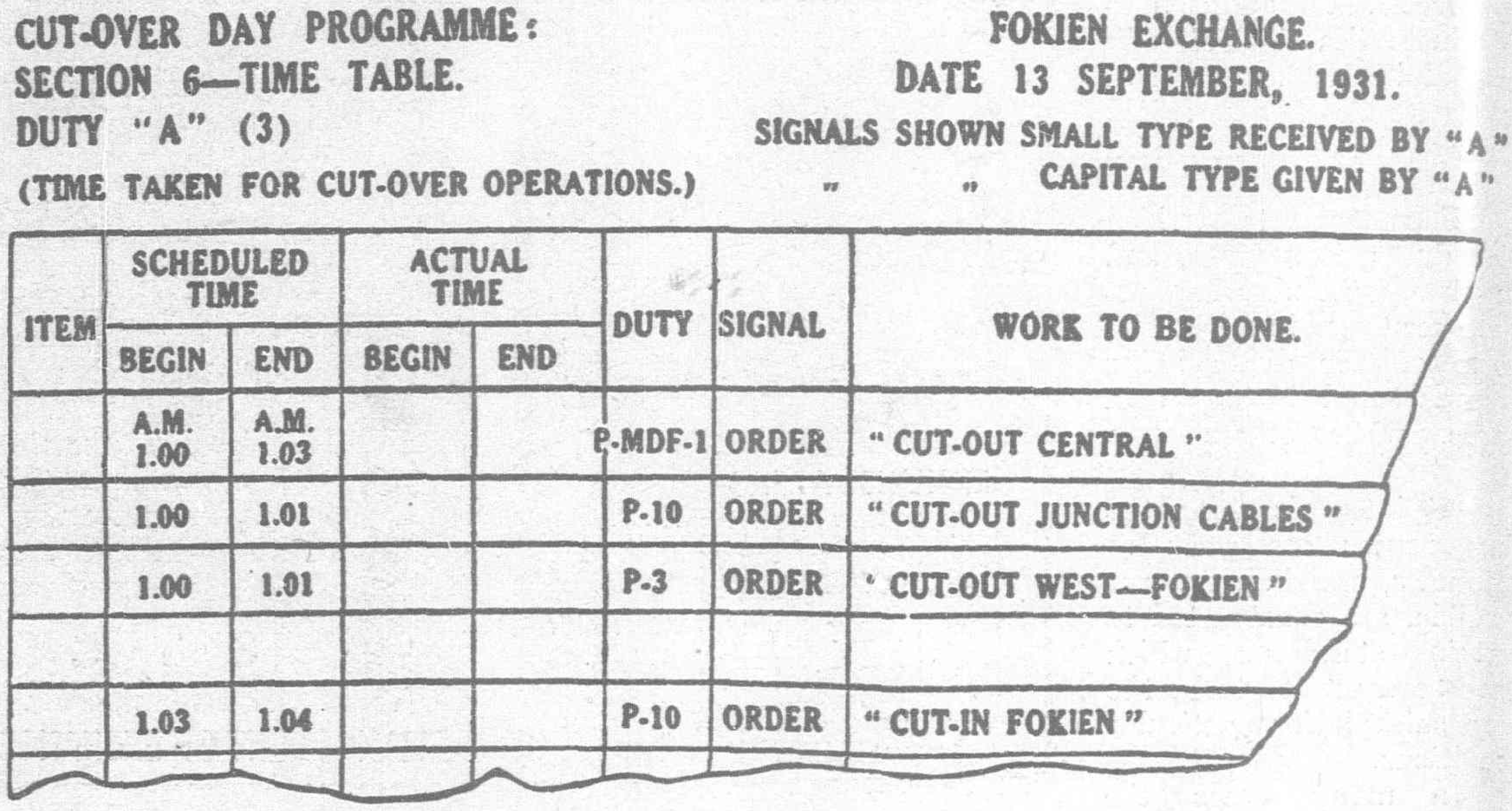


Fig. 1.—Diagram of Feeder Cable

blocks or alley-ways; (3) by aerial cable carried on poles.

The main feeder cable, which is a very expensive item, usually provides for not more than from five to eight years development of the area which it is designed to serve; but it is so arranged that the initial area may, at a later date, be subdivided into two or more ultimate areas; the additional area or areas being served by new feeder cables. The initial feeder cable is so planned that it can be picked up by the new cable at some prearranged point, without altering its physical lay-out.

This is accomplished by placing stubs in the feeder cable at points where distribution cable connections are, or will be required. The arrangement being such that all the pairs in the feeder cable are available in the stubs designed to serve each ultimate area.



CUT-OVER DAY PROGRAMME:
SECTION 6—TIME TABLE.
DUTY "A" (3)
(TIME TAKEN FOR CUT-OVER OPERATIONS.)

FOKIEN EXCHANGE.
DATE 13 SEPTEMBER, 1931.
SIGNALS SHOWN SMALL TYPE RECEIVED BY "A"
" " CAPITAL TYPE GIVEN BY "A"

ITEM	SCHEDULED TIME		ACTUAL TIME		DUTY	SIGNAL	WORK TO BE DONE.
	BEGIN	END	BEGIN	END			
	A.M. 1.00	A.M. 1.03			P-MDF-1	ORDER	"CUT-OUT CENTRAL"
	1.00	1.01			P-10	ORDER	"CUT-OUT JUNCTION CABLES"
	1.00	1.01			P-3	ORDER	"CUT-OUT WEST—FOKIEN"
	1.03	1.04			P-10	ORDER	"CUT-IN FOKIEN"

Fig. 3.—Section of Cut-over Controlling Engineer's Time Table

In the case of a large building the distribution cable is terminated on a special frame which provides cross-connecting facilities between the external cable and the building cable; further distribution inside the building being effected by house cable connected to small terminal boxes placed at convenient distribution points. House cables are designed to meet the ultimate requirements; and unless this is known in proper time and suitable accommodation is provided for cables, the installation may be exposed and subject to damage or be unsightly.

It is therefore very important that owners and architects when preparing plans for new buildings should make suitable arrangements for cable terminal boxes and station wiring.

Aerial and block distribution are similar in most respects, in that the distribution cables terminate on a series of distribution boxes placed at convenient locations on poles or on buildings. From these boxes the final distribution is carried out by individual pairs of wires running to the subscriber's premises.

The distribution boxes used on the block and aerial systems are of a type specially designed to prevent the ingress of moisture to the cable. Lengths of dry core, paper insulated stub cables containing from 10 to 20 pairs are supplied ready connected to these boxes; the free ends of these cables being joined to cables led from the main feeder cable.

Inside the box the stub cable connections are effectively sealed from contact with the atmosphere in order to guard against the lowering of the insulation of the cable.

Provision is made for testing the cable pairs, and for readily effecting changes in the distribution of the subscribers, without the necessity of re-opening the sealed connections. To provide these facilities, each conductor is terminated on a non-hygroscopic panel which forms part of the cable sealing chamber.

Previous to the re-construction, the distribution net-work had become congested and had lost its flexibility; and consequently in order to meet the demand for service, individual wires had frequently to be run, not to the nearest terminal, but to the nearest one containing spare cable pairs.

This resulted in an excessive use of drop or lead-in wires, some premises being served from points which, from a distribution aspect, were certainly not in the vicinity.

Additional points of distribution and re-routing necessitated different points of entry into subscriber's premises, resulting in very many cases, in the re-wiring of the installation from the point of entry to the telephone; more than 700,000 feet of wire has been used for this work alone.

During the work of re-constructing the outside plant, a high standard of distribution was set, and whenever such a procedure was economically sound, telephone lines have been transferred from overhead to underground, or from open wire to aerial or block cable, thus introducing the benefits of greater permanency and less liability to interruption, and also resulting in lower maintenance costs.

Up to the present 1,300 poles have been removed and 500 more are scheduled to be taken down in the near future. 430,000 feet of underground cable, 840,000 feet of aerial cable and 6,500 new distribution boxes have been placed up to date.

Subscribers' Apparatus.—At the point of entry into the subscribers' premises, protection is provided where necessary against lightning and power contact hazards. According to whether the line is unexposed or exposed a terminal block, or protector consisting of carbons and fuses is inserted between the outside and inside wires.

Subscribers in the 60,000 and 70,000 groups of numbers were already operating on what is known as the Common Battery System, and in these cases the existing instrument was rendered suitable for automatic working merely by fitting a dial. Some 3,500 dials have been fitted to instruments of this type. In the case of the magneto instruments, the question of conversion was not so simple, in that every instrument had to be entirely replaced.

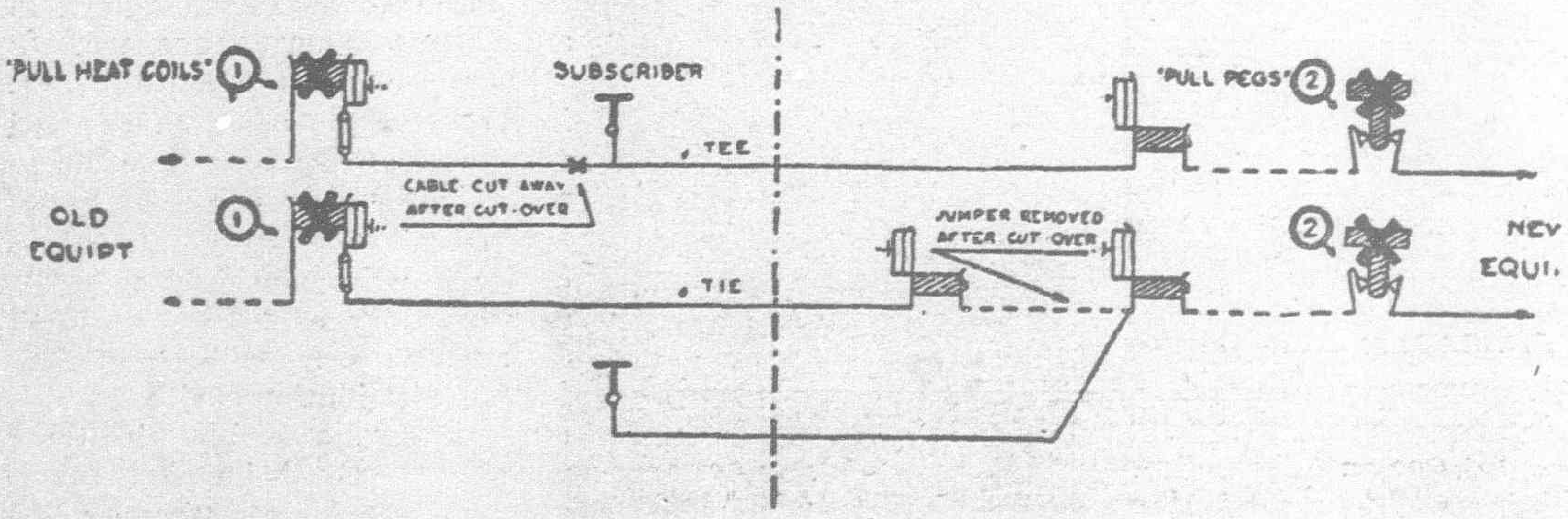
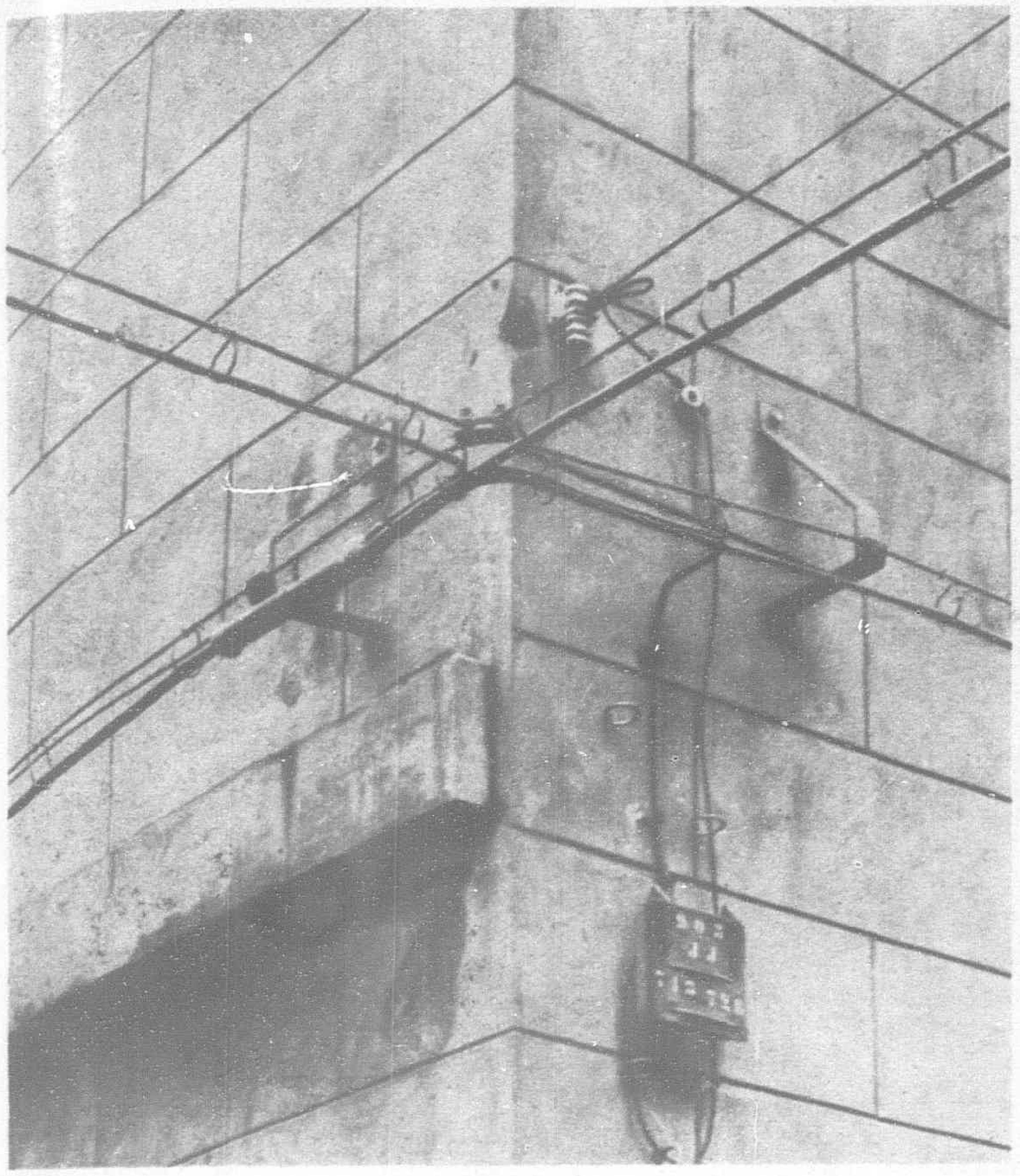
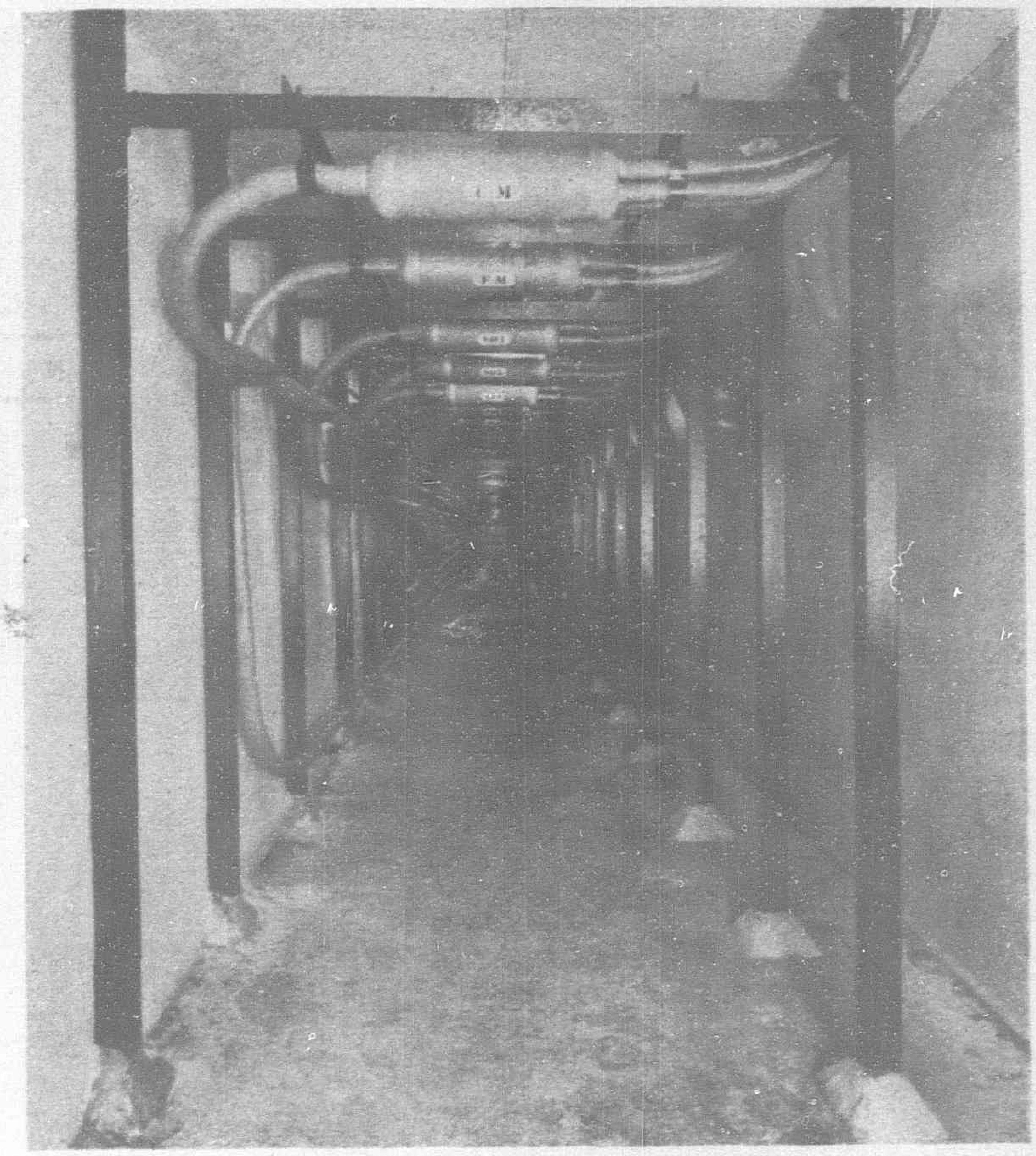


Fig. 4.—Illustration of Cut-over Operations

The conversion of a whole exchange area to automatic working takes place in the space of from two to four minutes, and consequently this replacement of instruments involved the fitting of the new telephone in such a way that the subscriber could continue to use the old instrument right up to the time of the change over, and could then immediately commence using the new one. Thus in the case of magneto subscribers the new instrument was installed adjacent to the old one some time prior to the actual



Block Distribution



Montigny Exchange—Cable Vault

change over, and the old telephones were recovered after the conversion had taken place. Approximately 14,000 instruments have been or are to be duplicated in this manner.

Some difficulty was met in this respect due to the fact that the shape and size of the automatic instruments is quite different to that of the magneto types. This necessitated, in the case of wall instruments, the installation of a special back board, which was designed to facilitate the fitting of two telephones without any additional drilling of walls, and at the same time to obscure any defacement of decorations which might result from the removal of the old and larger telephone.

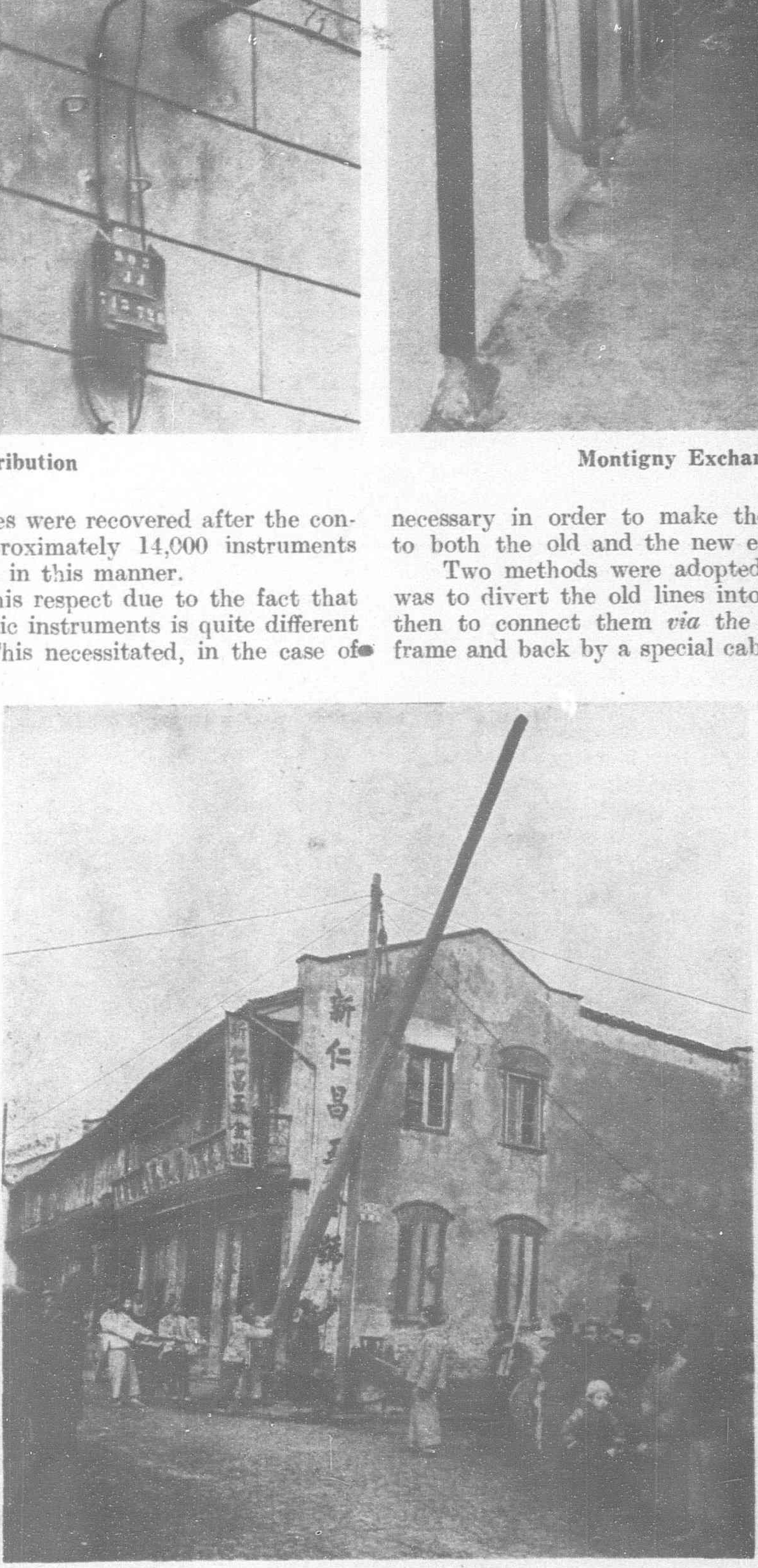
The telephones connected to the Erricsson Automatic central office which has been replaced, were changed after the service had been transferred to the Rotary Automatic; a difference in speech transmission precluding permanent retention.

Subscribers' Private Branch Exchanges were changed prior to the actual conversion to automatic working, special arrangements being made to permit the new type board operated over the old central office until the change-over took place.

Up to the present approximately 800 magneto P B Xs have been replaced by the new types.

Cable Arrangements.—Further operations, in connection with the conversion of the subscribers apparatus, were necessary in order to make the distribution network accessible to both the old and the new exchanges.

Two methods were adopted for this purpose: One method was to divert the old lines into the new exchange building, and then to connect them *via* the new exchange main distribution frame and back by a special cable to the old exchange.



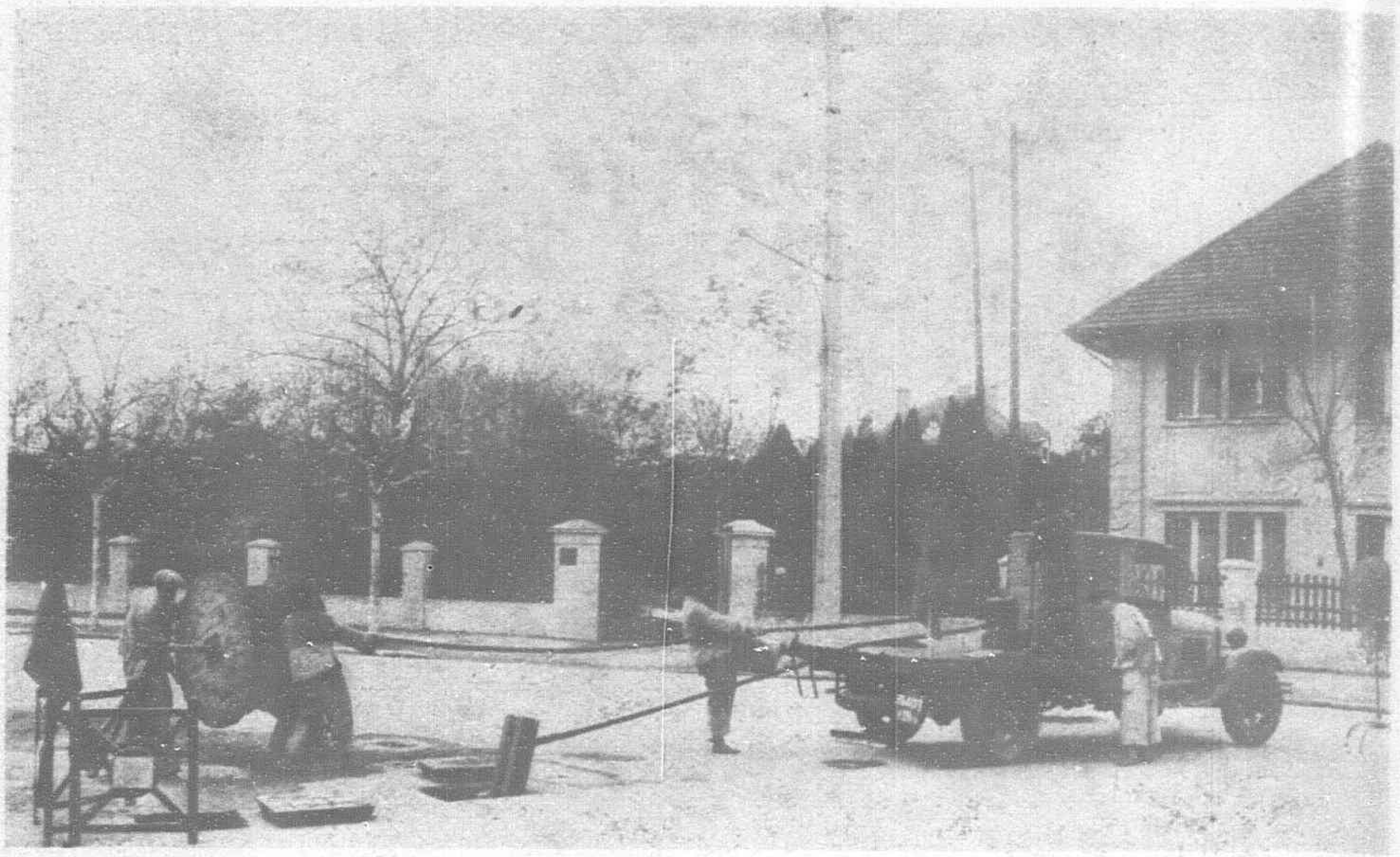
Coolies Removing Pole

The other method involved the running of a new feeder cable from the new exchange to a convenient point where it could be teed into the old cable. With this method the subscriber's line terminated at both the old and the new exchanges.

This work alone involved the use of 570 miles of cross-connecting wire on the new and old central office main distribution frames.

Cable Records.—The keeping of records during the reconstruction period has been a matter requiring considerable care and ceaseless vigilance. The possibility of error may be conceived when it is known that in 1930, 36,980 pairs radiated from the various central offices, and that upon completion of the re-construction there will be 72,780 pairs, each pair with a separate identity. Hundreds of pair changes have been necessary daily, and not a single pair could be changed without reference to the records.

A staff of 25 men have devoted their whole time to this work,—have issued authority for every contemplated change,



Pulling Underground Cable

—kept trace of the cable pair used for every new telephone installed—every old one taken down—and every change necessary to clear trouble on working lines.

Staff Training.—The training of staff required special consideration, personnel with a knowledge of telephone practice being difficult to recruit. Steps had to be taken to train new recruits in the various types of work, and also to train the existing staff concerning new methods and the new standards which it was desired to obtain.

More than 700 men have passed through our Telephone Training School, receiving courses the duration of which varied from one week to three months, while approximately 500 men including 152 foreigners have received tuition at evening classes in the same school. In addition much training work was done in the field.

Instruction of Subscribers.—For this very necessary and important part of the programme, special arrangements had to be made. A staff of 46 persons took care of the instruction of subscribers. The number of visits and revisits to subscribers made by this section up to the present time total 30,530.

Demonstration offices were established in various parts of the city, and subscribers were invited to attend these offices in order to receive demonstrations and practice in the use of the automatic telephone. Up to the present time 17,250 persons have taken advantage of this invitation.

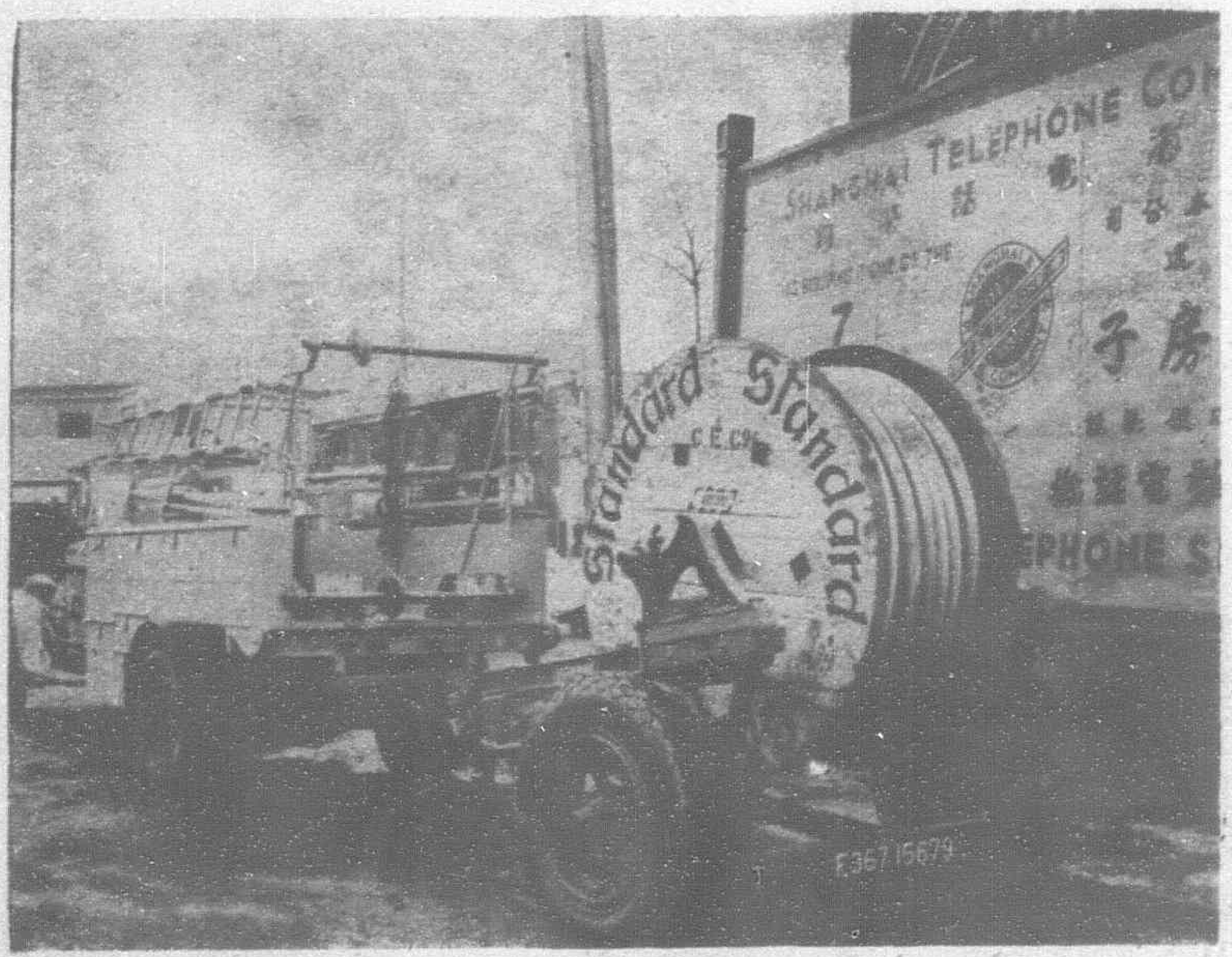
Cut-over Arrangements.—"Cut-over" is a term applied, in the telephone sense, to the transfer of lines from one exchange to another, and all work in connection with the transfer is generally termed "Cut-over arrangements."

In Shanghai a special division was organised to be responsible for the details of these arrangements, which included arranging of schedules, recording progress of the conversion and compilation of a new Master File of subscribers; in addition to the issue and control of the Cut-over Day Programme.

The new Master File was in two sections. One section giving all details of lines connected both to the old and the new exchange, so that a considerable time in advance of the cut-over a complete list of subscribers to be connected to each new exchange was available; the other section consisted of one history card for each line; this was used for recording the various stages of the conversion, *i.e.*, the change of telephone number, change from old to new cable and the various tests and advices to the subscriber, etc.

SHANGHAI TELEPHONE COMPANY—SUBSCRIBER'S CONVERSION HISTORY CARD.

For the proper co-ordination of all work in connection with the final stages of conversion and the actual cut-over to a new exchange, a very detailed schedule or programme is required. This includes a general summary of the work involved, detailed duties of all personnel engaged, and an analysis of all operations which must be completed before the words "cut-out"—"cut-in" can be given.



Modern Cable Truck Equipped with Winch and Trailer

P.C.4

OLD TELE NO......................NEW TELE NO..............

NAME ....

ADDRESS...

CABLE NO.......PAIR......PROTECTED/NON-PROTECTED......

COMMERCIAL "EQUIPT," CIRC.........DATE SENT............

APPARATUS AT PRESENT..............REQUIRED..............

APPARATUS FITTED (DATE)..........TEST REF. NO.........

COMMERCIAL "NO. CHANGE," CIRC......DATE SENT.........

OLD MULT-CH'KD TO NEW M.D.F. (DATE)......REF. NO....

TESTED AFTER CUT-OVER (INITIALS)...........REF. NO....

Fig. 2

To facilitate control, time tables were prepared stating the scheduled times for each order to, or report from each duty, while a Master Time Table was prepared for the use of the Controlling Engineer. A section of such a Time Table used in one of the recent cut-overs in Shanghai is shewn in Fig. 3. Cut-over Day Programmes were made up for each cut-over, each programme consisting of a book of some 70 pages.

The actual cut-over of a telephone net work is a striking example of the demand for strict discipline and co-operation. Failure of one cog in the machine at the critical hour could easily cause considerable dislocation.

It is usual to carry out a number of rehearsals several days in advance of the actual cut-over, especially to determine that each duty can be relied upon and that each Time Table properly interlocks.

The actual cut-over operation, which is more commonly referred to as the "Cut-over," consisted of cutting out the old and cutting in the new exchange. There are several places where this might be done, *e.g.*, old underground cables or internal cables leading to the old switchboard might be sawn off. This method is not ideal, for, in addition to the time factor, it is attended by some degree of risk through faults developing during the operation. The method adopted in Shanghai has been to cut out the old exchange by the removal of heat coils or line fuses on the old distribution frame, and cut in the new exchange by the removal of insulating pegs from the line test jacks on the new distribution frame. These insulating pegs were designed and made in Shanghai and permit of a record rapid removal.

A schematic drawing of the method of cut-over used in Shanghai is shown in Fig. 4.

Immediately after the cut-over every line was retested to prove that it had been properly cut in, and subscribers were called up over the new exchange system to make sure not only that their line was in proper order, but that they understood how to use the new telephone. A staff of instructors was in readiness to immediately visit any subscriber requiring additional instruction.

The cut-over of Fokien Exchange involved the removal of more than 7,500 heat coils and 4,000 insulating pegs; this operation was made in three minutes. The number of retests made totalled 8,000.

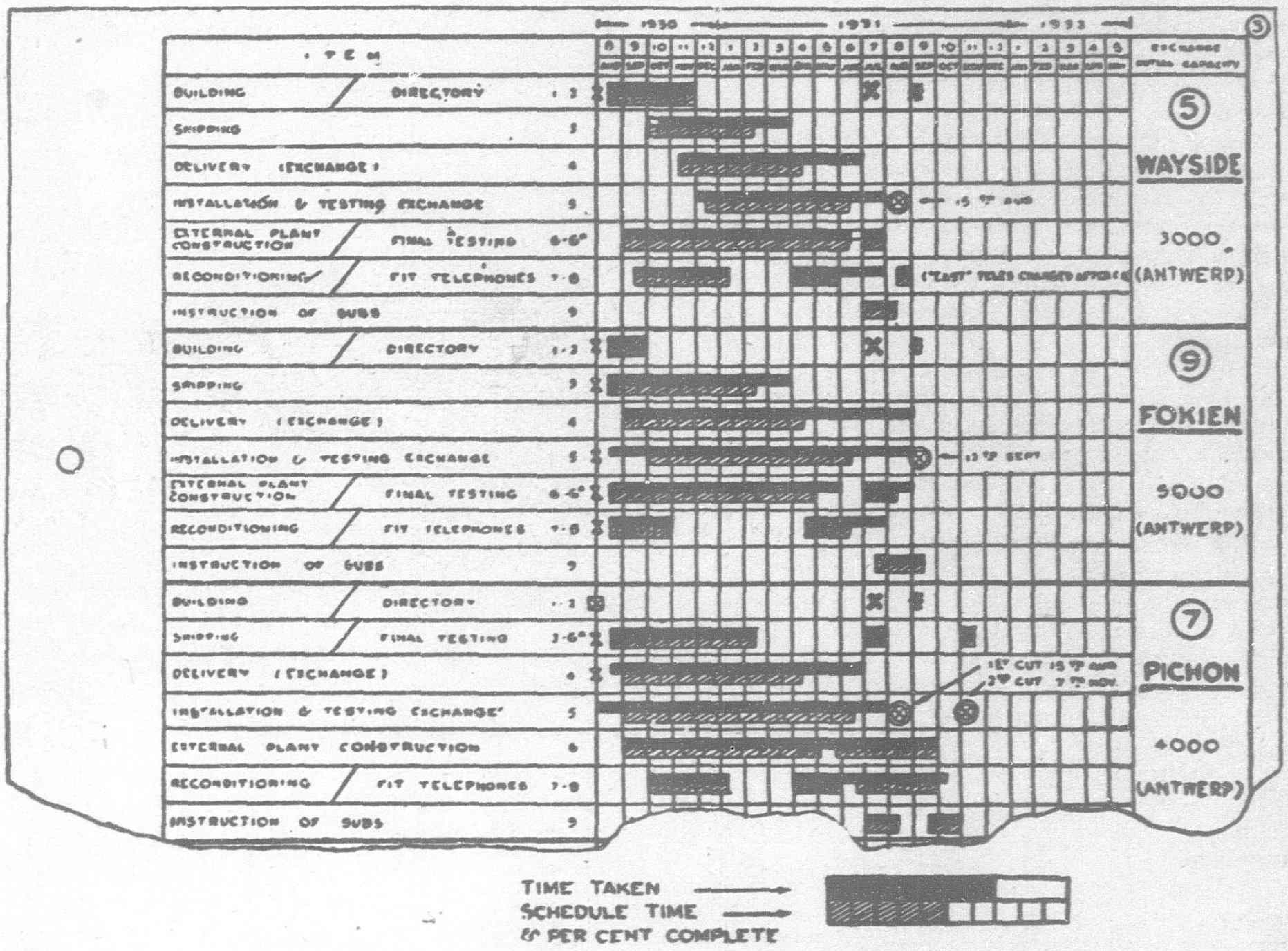


Fig. 5.—Section of Conversion Master Schedule

Schedules.—The various operations have been mentioned in sequence, actually each separate portion of the work was carried out by a distinct force; the object being to permit of specialization on particular types of work; to facilitate supervision and to control labour, the latter being largely inexperienced.

The successful completion of the programme necessitated the proper co-ordination of the many varied activities. This was obtained by preparing schedules for each item of the work, showing the period of time in which each item had to be completed; having due regard to the delivery dates of material and economy in staff.

The schedule was divided into seven main sections namely, (1) Engineering for buildings, plant, equipment and traffic. (2) Erection of buildings. (3) Installation of exchange equipment. (4) Reconstruction of outside plant. (5) Fitting of subscribers equipment. (6) Demonstration and instruction of subscribers in the the use of the new system and (7) Commercial, preparation of Directories, Changed No. lists and circulars.

These main sections were further divided into a number of sub-sections so as to facilitate control and checking of progress. A section of the master schedule is shewn in Fig. 5 and a section of a sub-schedule in Fig. 6.

The success of an automatic system depends largely upon intelligent use by the subscriber; that is on the proper observance of the tones or signals provided during the setting up of a call, the correct methods of dialling,—and generally, using the instrument according to the instructions provided.

In Shanghai at the present time of 300,000 calls originated 77.4 per cent result in conversations 18.6 per cent find the subscriber busy or receive no reply.

Approximately 3.2 per cent of the total attempts made are abortive due to the subscriber abandoning the call, while only 0.8 per cent are due to equipment failure.

Maintenance of Service.—The maintenance of the existing service and the continuous demand for re-arrangements has been a matter of primary importance—conditions have naturally not been ideal from a maintenance aspect, for there is no escape from interference with existing plant during a period of reconstructions, every practical precaution has been taken to keep the number of interceptions at a minimum, but there is no doubt that Shanghai telephone users have shewn considerable forbearance for which Shanghai Telephone Company is duly grateful. Both the company's records and the general public opinion indicate that the service is definitely improving as the programme advances.

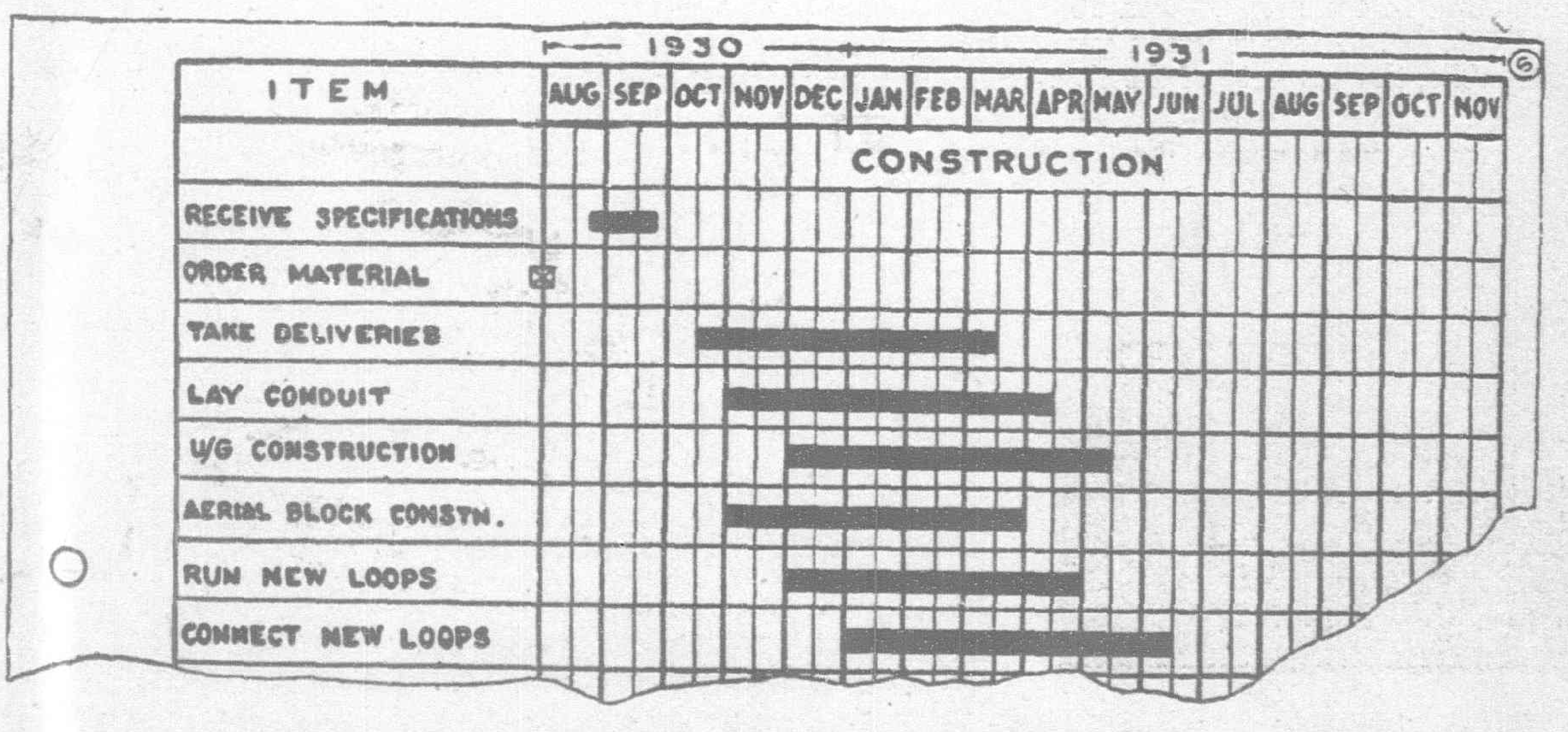
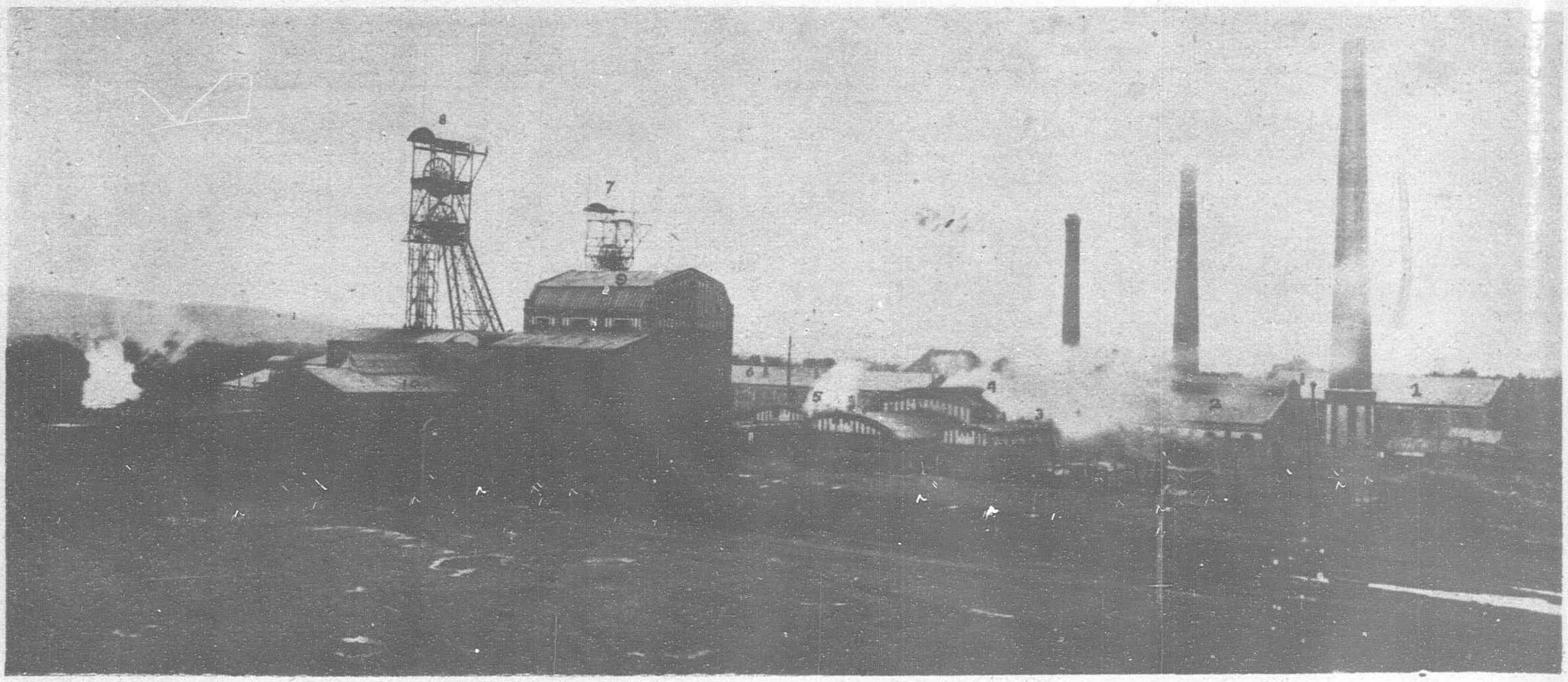


Fig. 6.—Conversion Program Section of Schedule of Sub-items

Acknowledgment is made of valuable assistance rendered by a number of the staff of Shanghai Telephone Company.



View of the Touchuan and Martha Shafts and mining plant of the Tsuchuan Mines

Coal Mining in Shantung

The Chung Hsin Colliery Company established at Tsao Chwang, Shantung, ranks as the first concern of its kind in the province and the third in China. In 1880 Viceroy Li Hung-chang appointed Tai Wah-tsao to start operations there with a capital of taels 20,000. The whole of this amount was invested by Chinese, and the mines were worked in the primitive native way. Later, however, the capital was increased and modern mining machinery installed. In 1895 further operations on the Chung Hsin coal-field were forbidden by the Governor of Shantung, but four years later, aided by foreign capital, Mr. Chang Lien-feng resumed the work. A general manager was appointed jointly by the Minister of the Northern Coast Provinces and the Mining Commissioner of Chihli. The new Company took the name of the Sino-German Chung Hsin Colliery Company, it being intended to make use of German capital, but the foreign support failed to materialize. In 1902 the term " Sino-German " was dropped, and the concern became known as the " Merchant's Chung Hsin Colliery Company of Yihsien, Ltd."

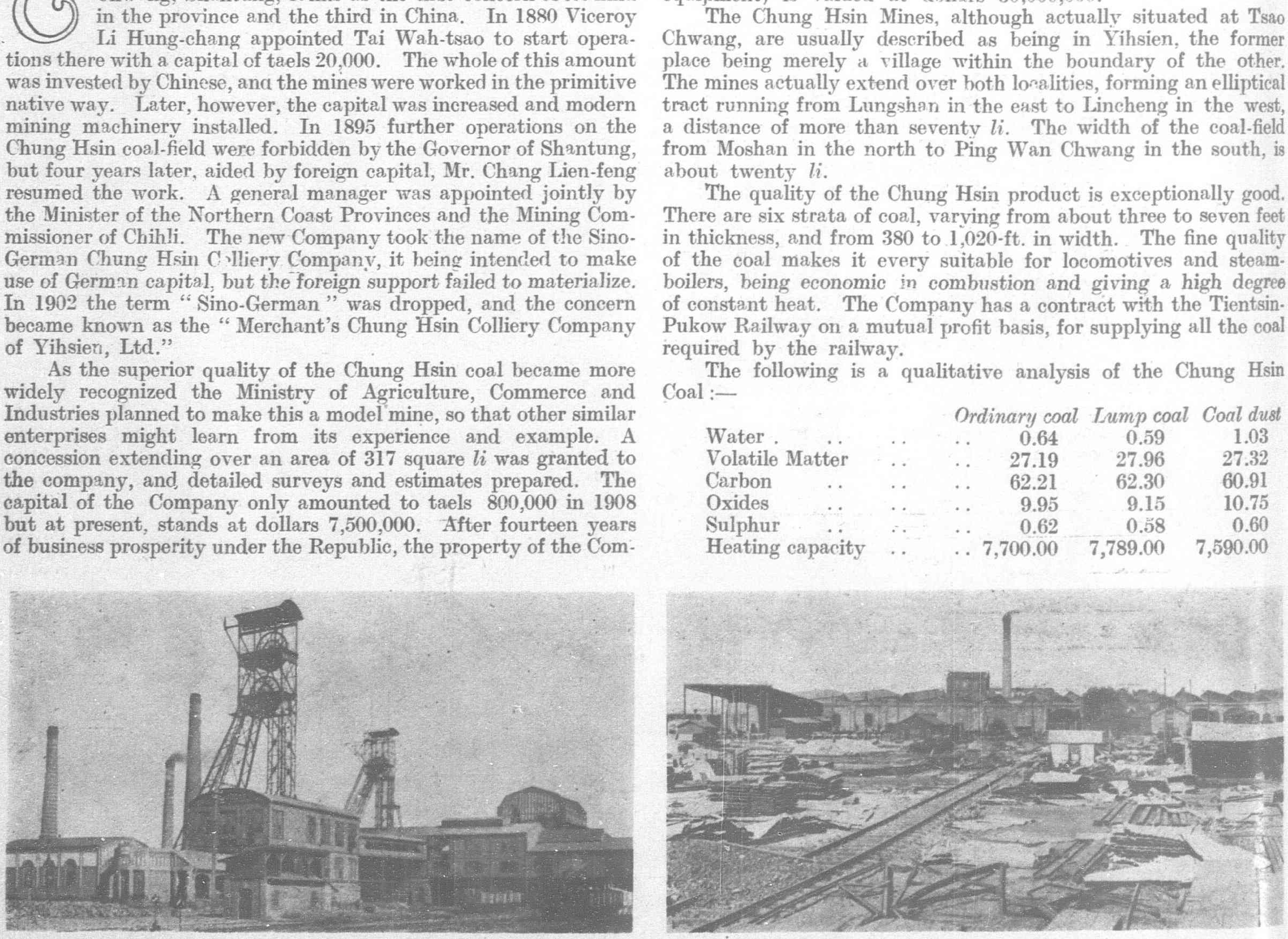
As the superior quality of the Chung Hsin coal became more widely recognized the Ministry of Agriculture, Commerce and Industries planned to make this a model mine, so that other similar enterprises might learn from its experience and example. A concession extending over an area of 317 square *li* was granted to the company, and detailed surveys and estimates prepared. The capital of the Company only amounted to taels 800,000 in 1908 but at present, stands at dollars 7,500,000. After fourteen years of business prosperity under the Republic, the property of the Company (including the sinking of two main shafts and mechanical equipment) is valued at dollars 30,000,000.

The Chung Hsin Mines, although actually situated at Tsao Chwang, are usually described as being in Yihsien, the former place being merely a village within the boundary of the other. The mines actually extend over both localities, forming an elliptical tract running from Lungshan in the east to Lincheng in the west, a distance of more than seventy *li*. The width of the coal-field from Moshan in the north to Ping Wan Chwang in the south, is about twenty *li*.

The quality of the Chung Hsin product is exceptionally good. There are six strata of coal, varying from about three to seven feet in thickness, and from 380 to 1,020-ft. in width. The fine quality of the coal makes it every suitable for locomotives and steam-boilers, being economic in combustion and giving a high degree of constant heat. The Company has a contract with the Tientsin-Pukow Railway on a mutual profit basis, for supplying all the coal required by the railway.

The following is a qualitative analysis of the Chung Hsin Coal :—

	Ordinary coal	*Lump coal*	*Coal dust*
Water	0.64	0.59	1.03
Volatile Matter	27.19	27.96	27.32
Carbon	62.21	62.30	60.91
Oxides	9.95	9.15	10.75
Sulphur	0.62	0.58	0.60
Heating capacity	7,700.00	7,789.00	7,590.00



General views of the Principal Plant of the Chung Hsin Coal Mines

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3

The total deposits in the Chung Hsin field are estimated at twenty billion tons, half of which is workable. The following table shows the annual output of coal since 1912 :—

	Tons		Tons
1912	250,000	1922	727,960
1913	250,000	1923	795,737
1914	248,420	1924	779,739
1915	144,825	1925	603,300
1916	349,399	1926	259,761
1917	428,064	1927	—
1918	518,593	1928	—
1919	566,018	1929	102,650
1920	693,112	1930	355,000
1921	659,266	1931	490,000*

*This figure represents the output from January to June only.

These figures show that the Company has not been in very active operation since 1926. Work was entirely suspended during 1927 and 1928 and in 1929 the mines were working only five months, owing to interruption caused by civil war.

The head office of the Company is in North Szechuen Road, Shanghai, with a branch office in Tientsin, and sales agencies at all the big stations along the Tientsin-Pukow, Lung-Hai, and Shanghai-Nanking Railways. The Company has an administrative staff of more than 500, and employs above and underground 2,268 laborers, of whom 1,805 are "inside," and the remainder "outside" workers.

The Chung Hsin Mines are operated on entirely modern lines. There are two main shafts, the Northern and Southern, less than a mile apart, but the underground passage leading from one pit to the other is more than four miles long. The Southern pit was sunk in 1916, and has a depth of 740-ft. Working day and night shifts 2,000 tons of coal can be brought to the surface every twenty-four hours, but this output is never reached. For one thing, the miners work in three shifts of eight hours, and during the intervals between changes there is some delay. Moreover, during its most prosperous period, when the demand for coal was great, the Company increased its output as much as possible, but owing to civil war breaking out the coal could not be taken to market. Stocks consequently accumulated, and the Company was forced to reduce the number of miners and shorten their working-time.

In 1921 the Northern shaft was sunk at a cost of $1,539,459. It has a depth of 940-ft., and all the equipment is twice the size of that in the Southern pit. The Northern shaft was worked only for a short period, as civil war broke out and 30,000 tons of coal has accumulated at the pithead. Work has been now resumed, and the daily output of the two pits averages from 1,200 to 1,300 tons.

The working staff is divided into two classes, "insiders" and "outsiders," the former being permanent employers. Wages are paid monthly and range from $7.50 to $58. The "outsiders" are engaged day by day by foremen, receiving a wage of about 30 cents. The permanent staff receive higher pay because they are employed in work that needs skill and carries responsibility, while the "outsiders" are employed on work where only physical strength is required. The local standard of living is very low so an "outsider" even with his scanty wages can maintain a family, provided he is diligent and thrifty.

Chung Hsin coal can be brought to market by railroad, or by water. The Company has its own sidings which join the T. P. R. at Lincheng in the north, and connect with the Grand Canal at Taichwang in the east. The T. P. R. has a branch line which reaches Tsao Chwang, where it meets the Chung Hsin siding. There are also two tracks connecting the Northern and Southern pits. In 1907 the Company built a line from Tsao Chwang to Taichwang through Yihsien, a distance of 80 *li*.

By its connections with the T. P. R., Chung Hsin coal can be marketed at Tsinan and Tsingtao in the north, and Hsuchow, Pangpu, Pukow, and stations along the Shanghai-Nanking Railway in the south. Shanghai and Pukow are the two chief markets. Going east from Hsuchow by the Lung-Hai Railway, Chung Hsin coal can be carried to Haichow, where it can be shipped abroad or to Shanghai. A waterway connects the Taichwang and Tsao Chwang Railway with the Grand Canal at Taichwang. The Company has eighteen lighters on the canal, 10 carrying a load of 25 tons each, and eight carrying 50 tons. They are used to transport coal to Chingkiang and Yangchow. From Taichwang to Chingkiang, a distance of 360 *li*, transportation costs about 0.33 cents per ton per *li*, and from Taichwang to Tsingkiangpu, a distance of 760 *li*, the cost is about 0.44 cents. These charges are very low, but unfortunately, owing to civil war, these routes are not always open.

The Company used to own 300 railway-trucks and cars, and about a dozen locomotives, but now has in its possession only six locomotives (two under repair), three passenger cars, two guard-cars, tank-cars, eight platform-cars, 65 coal-trucks (13 of them carry 40 tons each, one 20 and the rest, 15 tons), while about 50 other trucks of various kinds are so dilapidated as to be useless. With such great losses of rolling stock the Company finds great difficulty in maintaining a good transportation system. According to the contract between the Company and the T. P. R., $12 is to be paid to the latter for every train passing over its Lincheng-Tsao Chwang branch; the T. P. R. receives 1.3 cents per ton per *li* for carrying the Company's coal; by a reciprocal arrangement the Colliery Company supplies the railway with coal. The Company plans to build a light railway from Taichwang to Haichow, so as to secure a short-cut to the sea for shipments abroad and to Shanghai. The cost of this line is estimated at $800,000, and with the help of this new outlet for supplies, the Company hopes to recover former prosperity in a few years.

Chung Hsin coal is very cheap. Ordinary quality is sold at $9.50 per ton at the mines, and about $16.50 in Shanghai. When the railway from Taichwang to Haichow is completed Chung Hsin coal will have a good prospect of securing a share of the business now monopolized by the Kailan and Fushun products. With Government assistance, good management and labor-unions working in harmony with the employers, the Chung Hsin Colliery Company has a bright future, and may well hope to become a model of modern Chinese industry.

The following is a list of the twenty coal-mining companies operating in Tsechuan, Poshan and Changkiu, Shantung province. As this information has been compiled from very recent records, it is believed to be complete and authentic

Company	*Location of Mine*	*Approximate Daily Output Tons*	*Market Supplied*	*Remarks*
Lu Ta	Tsechuan city	1,000	Kiaochow-Tsinan Railway, Shanghai	This company is operated jointly by the Chinese and Japanese Governments in pursuance of the Shantung Treaty.
Tien Yuan	60 *li* south of Changkiu	200	Local, Tsinan, Tsingtao and Shanghai	
Yu Tung	65 *li* south of Changkiu			
Yun Yuan	South of the Tien Yuan colliery	300	Local	
Hsu Hwa	45 *li* southeast of Changkiu			Sino-Japanese concern.
Li Hsin	35 *li* southwest of Tsechuan	200		
Yu Tung	25 *li* south of Tsechuan	250		
Pao Hsin	40 *li* south of Tsechuan	60		
Kwei Shen	30 *li* south of Tsechuan	100		These collieries have been leased.
Yue Sheng	20 *li* northeast of Poshan	300	Shanghai	
Tung Hsin	Two collieries : 1. 20 *li* north of Poshan 2. 30 *li* southeast of Poshan	300		
Ta Chen	5 *li* southeast of Poshan	200		
Ki Chen	6 *li* southeast of Poshan	250		
Tung Foong	10 *li* southeast of Poshan	200		
Yun Ho	20 *li* southeast of Poshan	150		This company is making extensions.
Po Tung	25 *li* southeast of Poshan	300	Japan	Sino-Japanese enterprise.
Chung Hsin	30 *li* southeast of Poshan	1,900		
Tung Chen	25 *li* southeast of Poshan	100		
Hwa Tung	West of Poshan	300		
Ting Sin	25 *li* east of Poshan	50		

Notes on Coal Mines in China

CHUNG YUAN COAL MINE.—The Chung Yuan Coal Mine is located in Honan Province. The mine is divided into two groups, commonly known as the east and the west coal fields. The east coal field covers an area of 57 sq. miles, which extends from Li-ho to Ma-chen. The west field covers an area of 11 sq. miles which extends from Changchow to Fengfongchen. Taokow-Chinho Railway joins the mine with the Peiping-Hankow Railway.

In the west coal field there are numerous native pits. It is in the east coal field that modern machinery is used for the production of coal. Altogether there are four shafts in the east coal field, operation of which was started in 1922. The No. 1 and No. 2 shafts were constructed in 1923 while the third and fourth were recently completed. A total of 400 tons of coal is produced in these shafts daily. Together with the production of the native pits, the total production of coal of the field is estimated to be about 3,000 to 4,000 tons a day.

The annual production of coal of the mine is as follows :

1927	93,928.45 tons
1928	313,123.30
1929	194,430.60
1930	269,318.00
1931*	271,395.00

THE PENGHSIHU COAL MINE.—This mine is situated at Liaoning Province, 47 miles from Shenyang, 127 miles from Antung and 283 miles from Dairen. It is a Sino-Japanese concern with Chinese and Japanese directors. The mine extends from Penghsuhu Hsien to the Shenyang-Antung Railway and covers an area of 28 sq. miles. It is estimated that the coal reserve of the mine amounts to 10,000,000 tons. The composition of coal is as follows :

Seam	*Volatile matter*	*Carbon*	*Ash*	*Sulphur*
1st	75.85%	7.24%	—	0.71%
2nd	14.89	68.48	—	1.598
3rd	15.10	73.09	11.81	1.502
4th	17.82	76.84	5.34	1.550
5th	18.18	72.34	9.50	2.351
6th	15.94	75.40	8.66	1.530
7th	17.51	73.97	8.51	1.382
8th	17.30	63.52	19.18	1 609

In the mine there are six shafts in operation. The particulars about these shafts are as follows :

Shaft	*Depth*	*Production of coal per day*
1st	1,738.42 ft.	—
2nd	1,348.69	295 tons
3rd	1,092.40	515
4th	634.96	265
5th	650.61	265
6th	489.66	425

The production of coal of the mine since 1910 is as follows :

Year	*Production of coal per year tons*	*Year*	*Production of coal per year tons*
1910 ...	... 5,800,000	1922 ...	... 6,500 000
1911 ...	... 9,035,208	1923 ...	... 37,300 000
1912 ...	... 18,519,900	1924 ...	... 45,000 000
1913 ...	... 27,078,213	1925 ...	... 40,000 000
1914 ...	... 30,101,402	1926 ...	... 41,500 000
1915 ...	... 27,577,702	1927 ...	... 39,800,000
1916 ...	... 32,262,560	1928 ...	... 49,000,000
1917 ...	... 43,800,851	1929 ...	... 52,100,000
1918 ...	... 37,496,498	1930 ...	... 60,000,000
1919 ...	... 41,699,400		
1920 ...	... 43.909,992	Total ...	...684,281,825
1921 ...	... 33,800,000		

SHUITUNG COAL MINE.—This mine was organized and the work was started in 1924. It covers an area of 200 sq. miles at the boundary of Shunchen Hsien and Ningkou Hsien, Anhwei Province. The total reserve of the mine is 8,359,000 tons.

There are five shafts in this mine and the production of coal in 1928 was 16,792 tons.

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*The figure for 1931 is only that of the first four months of the year.

The Difficulty

(Continued from page 65)

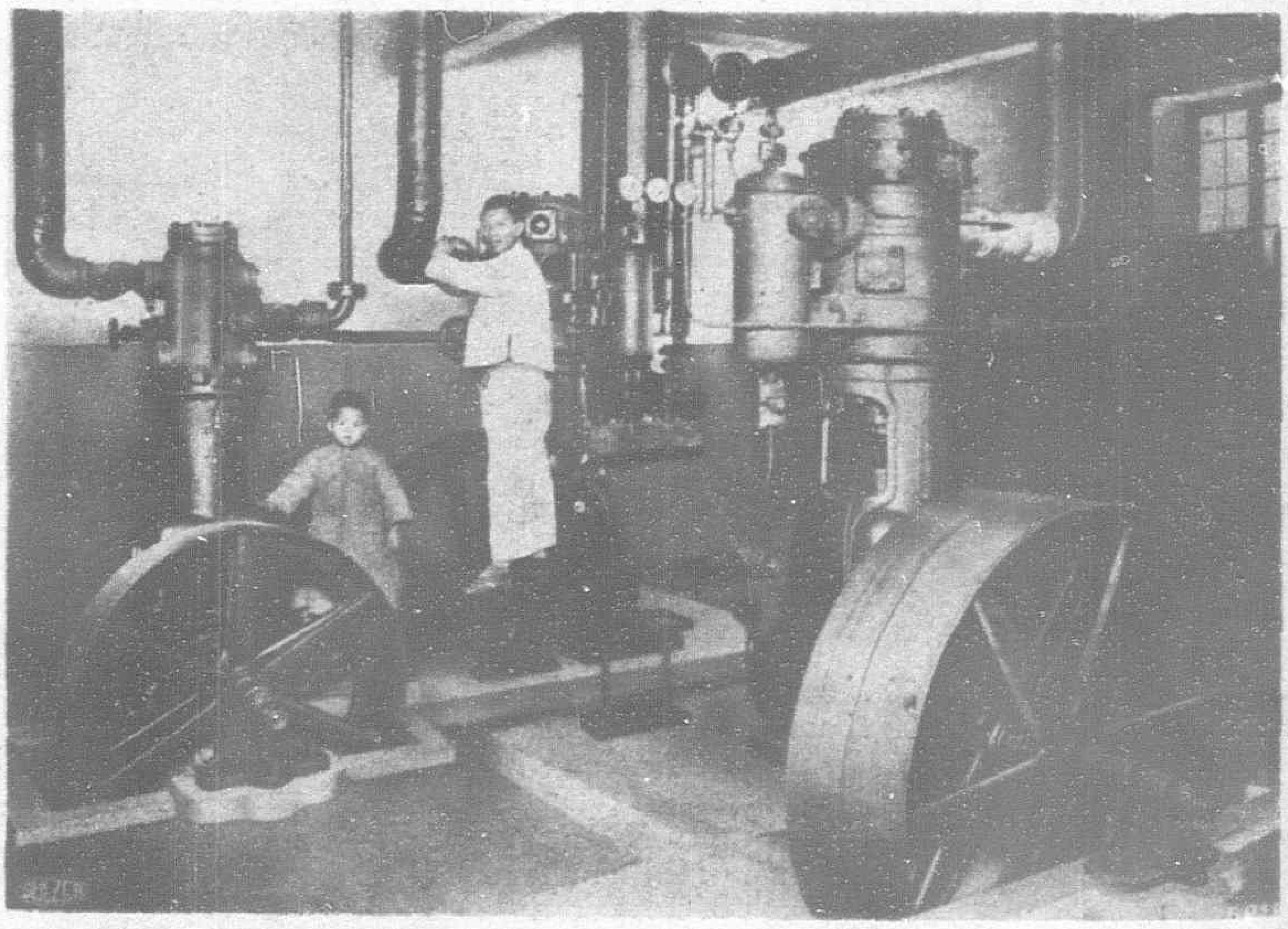
sic stantibus, and since each State remains its own judge of whether the exception, under which the treaty would lapse, is applicable, then no treaty has any force or utility !

" It should be added that the proposed processes of intercession, conference and consultation, if adopted, would tend to cut down immensely the possible cases of unregulated self-defense. Such measures should enable our government to distinguish between a real case of self-defense and that in which it was alleged as a pretext for aggression. Finally, the assurance given by the American Government that it would itself take positive measures against the malefactor would make it less likely that States in fear of attack would feel impelled to act in ' aggressive self-defense.'

" We submit, then, that the problem of self-defense is not an unsurmountable obstacle to our plan for making the Pact of Paris effective. In most cases, the State making war would be a member of the League, and thus prevented from alleging self-defense with impunity. As for States outside the League, the self-respect of governments, the fear of the sanction of public opinion, the possibility of concerted action taken against an aggressor, especially with our collaboration, and finally the existence of some limitations in international law ought to discourage abuse. And if worst comes to worst, and the allegation of one, or even both parties, that they are fighting in self-defense, makes it impossible for the President to determine the Pact-violator, no harm will be done, for, finding that the equities of the war were not clear, or that the identity of the aggressor was uncertain, our country would merely refrain from applying positive measures."

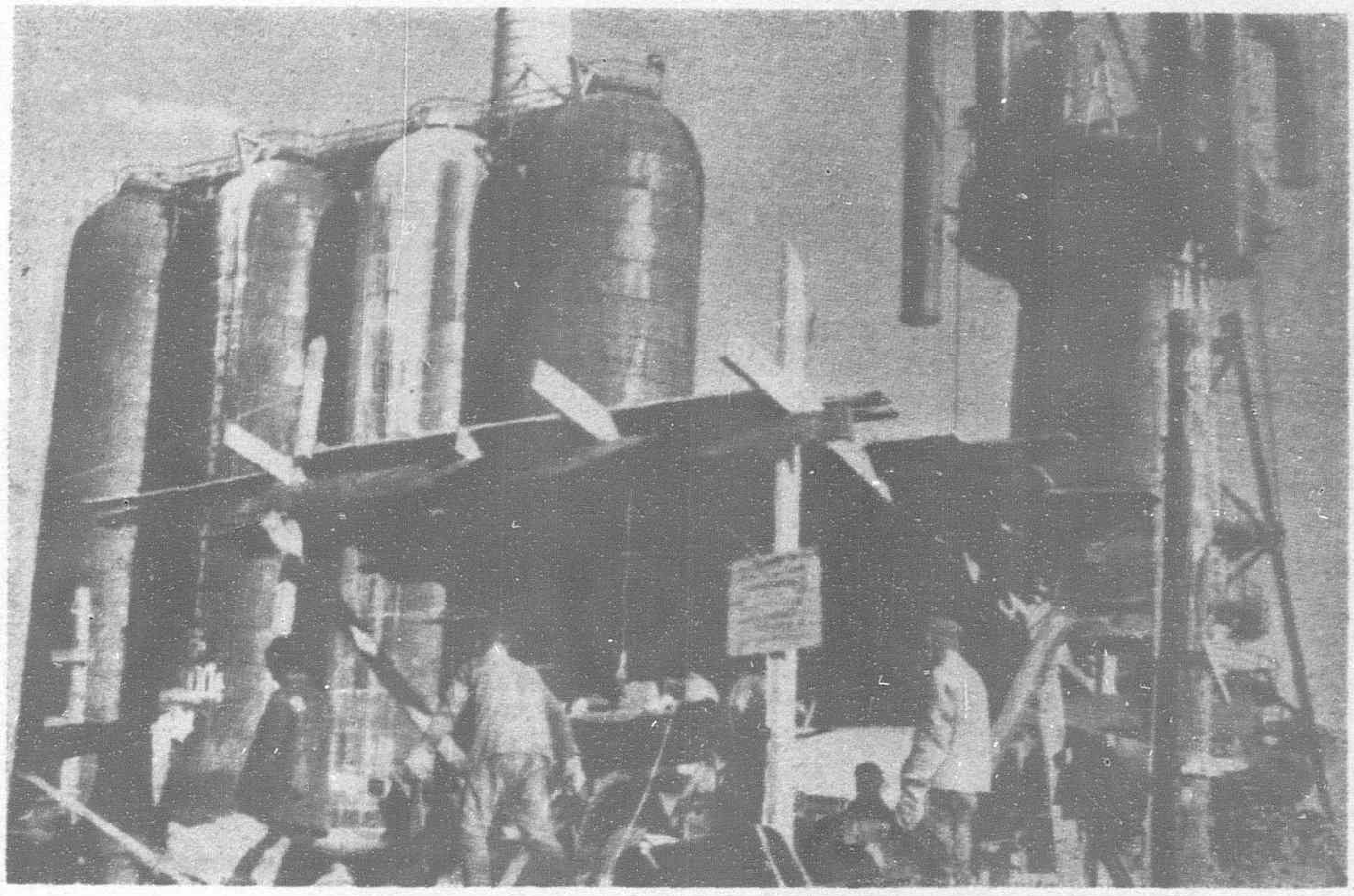
Ice Factory at Hankow

The Hankow Pure Ice Co., Ltd., Hankow, has put in service an ice-making plant, which can claim, according to reports received, to be the most up-to-date plant of its kind in China. The ice cans are automatically filled with water from the filters ; conveying devices and agitators are mechanically driven, and an electric crane serves for handling the ice cans ; it is consequently impossible for the water or ice to be touched or dirtied in any way. The plant, which produces 20 tons of ice daily, is equipped with two Sulzer vertical compound compressors, with a total rated capacity of 532,000 B. Th. U. per hour. There is also an ice store with a capacity of 65,500 cub. ft. which is cooled by a separate Sulzer compressor, of the vertical single-stage type.



Machine-room of the Hankow Pure Ice Co., Hankow, equipped with three Sulzer Vertical Ammonia Compressors, total rated at 400,000 B.T.U. per hour

The Siberian Capital, Novo-Sibirsk



At work on the Blast Furnaces of the Kuznetz Steel Mill

Novo-Sibirsk, the capital of Siberia, is one of the fastest growing of the pioneer cities in the Soviet Union. In the past five years it has increased its population by about 75 per cent and this is now estimated at 210,000 inhabitants. In the next half-dozen years it is expected to grow to almost treble this number. From a sprawling town of primitive wooden structures a few years ago it is growing to a modern city with large and up-to-date buildings.

Novo-Nikolayevsk, as the city was known until 1925, when the name was changed to Novo-Sibirsk, started with a few fishermen's huts put up in 1892 where the bridge of the Trans-Siberian Railroad crosses the Ob River. The town had a population of 7,500 in 1902, with a ramshackle tavern as its social center. Honey, grain, oil, unts, cattle and furs, which came from the fields and forests for hundreds of miles around, were brought to Novo-Nikolayevsk to be sold there or shipped by rail to other cities. By 1908, when another railroad line linked it with Barnaul, to the south, Novo-Nikolayevsk's population reached 46,000, the town becoming the trading center for all of southwestern Siberia. Factories producing leather, butter, soap, etc., were erected and the industrial life of the city began to grow.

However, it was only five or six years ago, when Kuznetz Basin, of which Novo-Sibirsk is the principal center, began to assume considerable importance as an industrial region, that any substantial efforts were made to modernize the city. In 1926, when the population had already grown to 120,000, three million roubles were spent on municipal improvements, in the following three years a total of 36 million, and last year 37 million roubles ($19,000,000) were appropriated. Formerly the city covered 12,500 acres; now the city limits are being extended over an area many times as large.

In spite of the rapid progress recorded the city is still in the early stages of municipal improvements. Most of the streets are dirt roads and there is no trolley line. However, the plans for 1932 call for the construction of a street-car line and a large increase in the number of buses. Its modern transport facilities at present comprise only a score of buses.

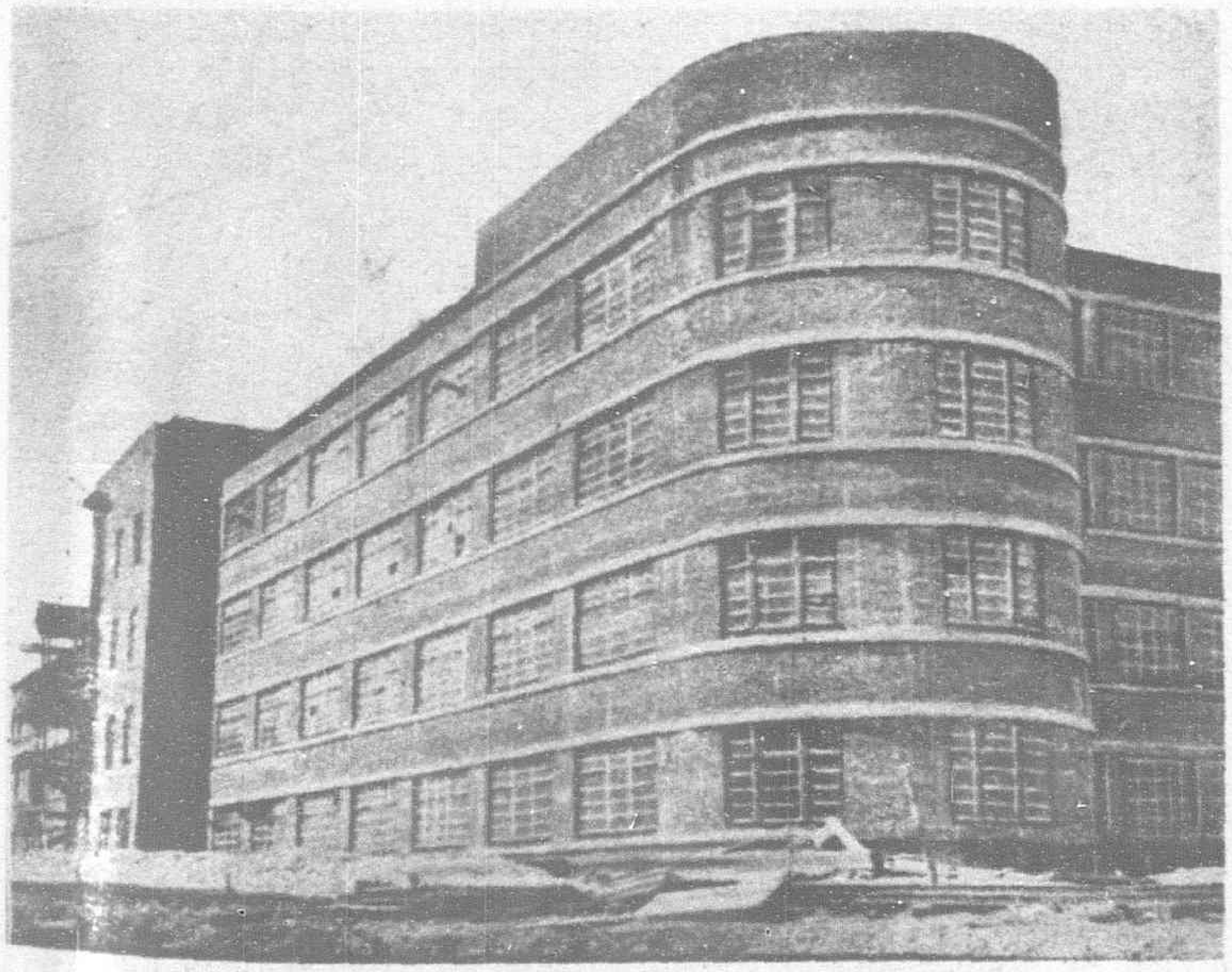
The railroad station now consists of a small, forty-year-old building with numerous later additions. In the rebuilding of the city one of the chief structures is a new railroad station which will be the most modern and the third largest in the country. At the section of the city where the Ob and Inia Rivers join, a freight transhipment junction and a double-tracked railroad bridge are being built.

World's Largest Harvester Plant

The world's largest combine (harvester-thresher) plant is being erected just across the river in a new section of the city, at a cost of 60 million roubles ($31,000,000). At present this part of the city already has a population of 24,000, which is rapidly growing. Construction was begun at the beginning of 1930 and is scheduled to be completed next year. Three shops have already been completed and will start operations this year—the machine and tool shops and a repair shop—and by the end of 1932, 31 other departments are expected to be ready for work. The plant will produce 15,000 combines annually, in addition to 35,000 tractor seed drills, and 30,000 tractor hay mowers. In the entire Siberian territory there were only three combines two years ago.

A large plant is under construction in another new section of the town which will produce coal-mining equipment. There is now a settlement of 7,000 around the site, but within a few months, as construction operations develop, it is expected to house 23,000. This plant will supply equipment for the Kuznetz Basin coal field.

At present the city is lighted with a power station of 5,500 kilowatts capacity, which provides only 28 kilowatt-hours a year



Offices of the Novo-Sibirsk Combined Harvester Plant

The Dynamo Hotel in Novo-Sibirsk

per person as against the 70-80 kw.-hr. considered necessary. A new plant is under construction which will generate 300,000 kw.

Novo-Sibirsk is growing so rapidly that there is an acute shortage of housing. Construction is going on everywhere, yet the dwelling space per person (four square meters) is still less than half the norm. By 1934 it is expected that modern buildings will replace all the old wooden structures. At the combine plant a "socialist city" is being built, twenty apartment houses being up already and more under construction. The sewage and water supply systems are also far below the requirements. Few of the streets have water mains as yet and, due to the severe winters, these must be laid thirteen feet underground. A shortage of labor in every field makes it difficult to expand construction at the rate demanded.

Cultural Development

Culturally, the city is expanding as rapidly as industrially. A number of universities and technical colleges are already in existence or being built, although two years ago there were none. The first Siberian Institute of Railway Engineering, which is now under construction, will have four college buildings, each five stories high. There will be a dormitory for the students and research workers, which will be the biggest building in the city, costing six million roubles.

A new hospital is being built in the nearby pine woods, which will be connected with a medical college. Another pine tract has been selected for a Park of Culture and Rest, upon which over 50 million roubles will be expended during the next few years. In a number of other places along the Ob River wooded land has been set aside for parks, rest homes and vacation resorts.

A hotel built last year, which was the largest in the city, has been outstripped by the new Dynamo Hotel built by the athletic association of the same name—a five-story building with a roof garden. A number of new banks, department stores, and large office buildings have also been constructed.

One of the most striking of the new structures is a theater seating 3,000, which has been designed along the most modern lines. It has been built in a semi-circle with domed ceiling 200 feet in diameter which can be used as a planetarium. The stage is a revolving affair with spacious wings, and there is a rail encircling the building at the second floor upon which 500 feet of sets run, permitting a great number of changes of scene for each performance.

Novo-Sibirsk is 200 miles northwest of the Kuznetz Basin, one of the largest mining fields in the world, from which the coal is transhipped *via* Novo-Sibirsk. The city is in the center of the Ural-Kuznetz combine, which includes the great steel and coal district of Kuznetz Basin and the steel mills of the Urals. Steel mills, non-ferrous metal plants, coal mines, and power stations are under construction on all sides.

In addition, Novo-Sibirsk is surrounded by rich agricultural regions. Large quantities of grain are grown in West Siberia, livestock breeding, flax and sugar production are important. Dairy products, especially butter and eggs, are produced in large quantities, and many varieties of fowl. Meat-packing plants have been built recently. In general the region is one of the main sources of grain and food products in the Soviet Union.—*Economic Review of the Soviet Union.*

New Mitsubishi Plant in Korea

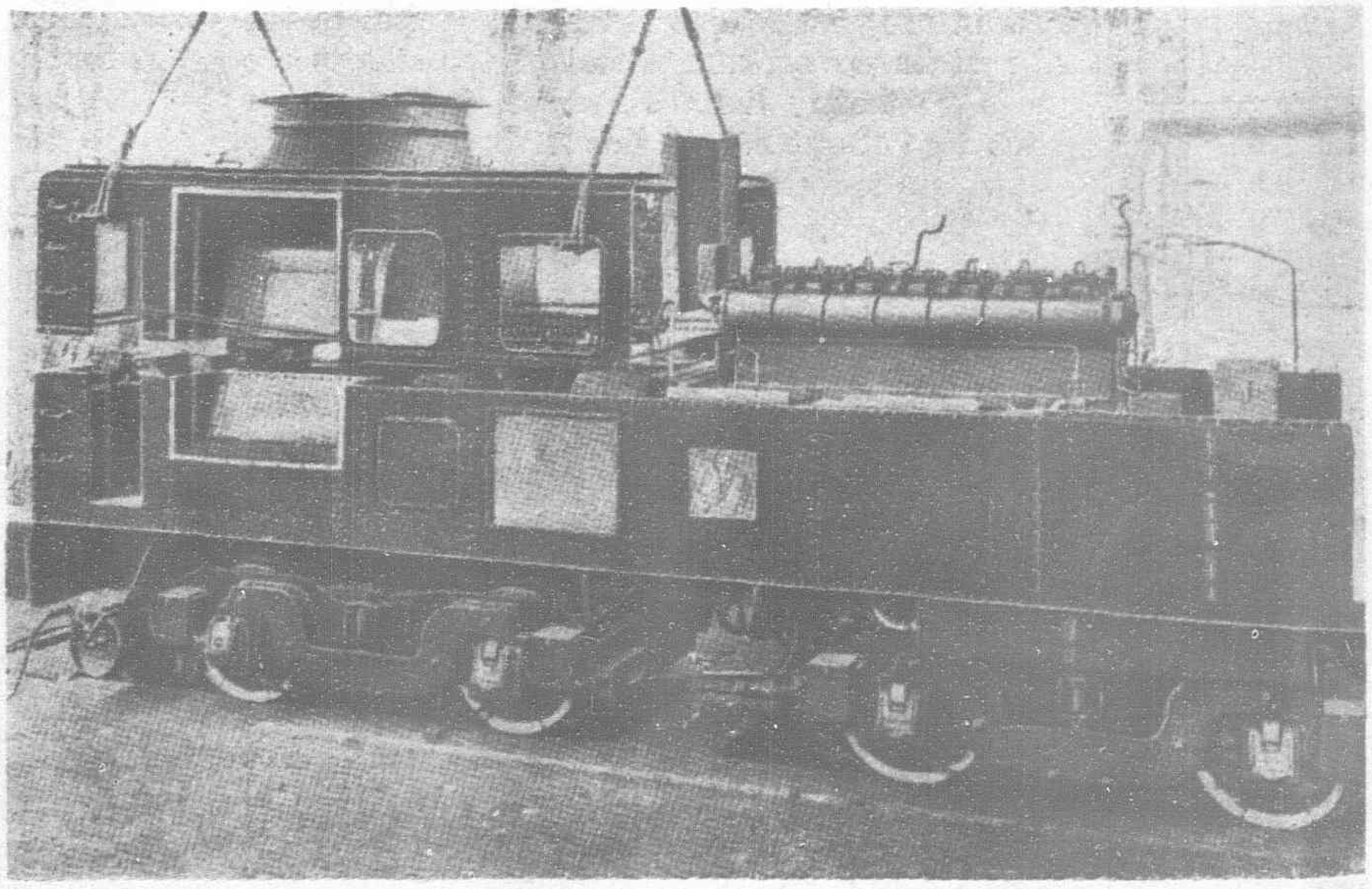
A Y.8,000,000 iron foundry is to be erected in Korea by the Mitsubishi Mining Company which owns a big mine in Kankyo province.

This mine, it is said, comprises a vast area of iron veins, and though no accurate figure is available it is supposed to contain between 100,000,000 and 1,000,000,000 tons of ore. The percentage of iron, however, is small and the Company hitherto has left the mine idle.

Investigations, however, have now convinced the Company of the advisability of starting mining, as the magnetic separation process will enable it to carry on the business on a commercial basis.

The proposed foundry will be erected in Seishin where the Company has already arranged for the purchase of the necessary land. The construction of the foundry will be started some time in the middle of next year.

Diesel-electric Locomotive for Manchuria



The New Diesel-electric Locomotive being assembled

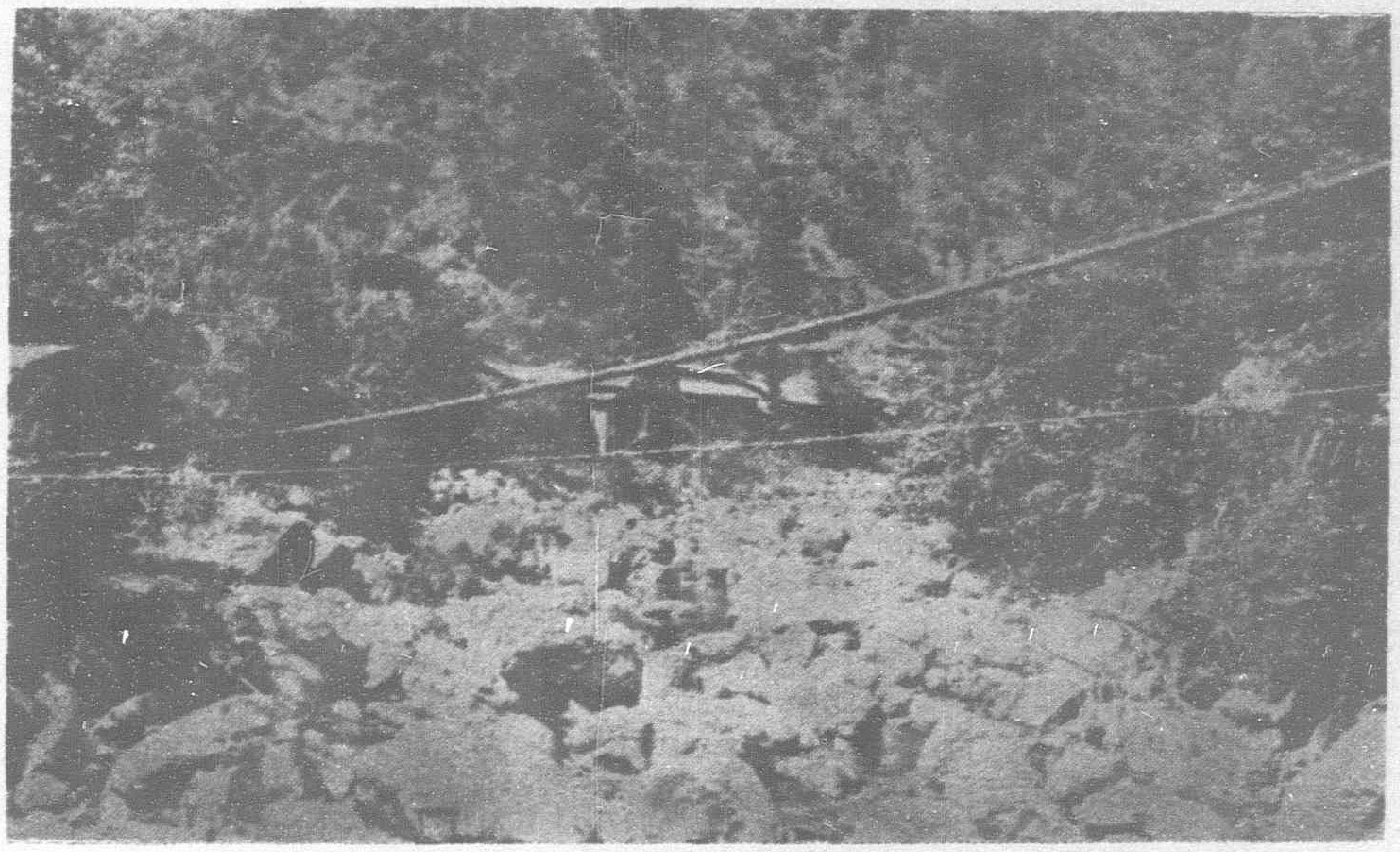
A new Diesel-electric locomotive has recently been completed in the works of Maschinenfabrik Esslingen for the South Manchurian Railway, Dairen. The locomotive of the 0—4—0+0—4—0 type has two bogies with two driving axles each. They are driven by four 100-kw. axle-suspended motors. The enclosed upper portion of the locomotive, containing two engine rooms and two driving cabs, rests doubly spring-borne on the bogies at four points. The prime mover, constructed by Maschinenfabrik Augsburg-Nürnberg, is a seven-cylinder four-stroke Diesel engine with airless fuel injection, developing 700-h.p. at 700 r.p.m.; its unit weight is 9 kg. (20 lb.) per h.p. The cooling-water is circulated by a centrifugal pump with electric drive, which is controlled from either of the driving cabs. The reversing controller, the starting and stopping gear for the engine as well as that for setting it to the three working speeds of 300, 500, or 700 r.p.m., are electro-pneumatically operated from the driving cabs.

The electrical equipment has been supplied by Messrs. Brown Boveri & Cie. The generator of 435-kw. and the 68-kw. exciter have a common shaft, which is rigidly coupled to that of the Diesel engine. The exciter also supplies the current for all the auxiliary drives. A storage battery is provided for starting the Diesel engine, and to enable all the auxiliary drives to be run when the Diesel engine is at rest.

The radiators for cooling the water and oil are mounted in the sides of the locomotive; the necessary cooling-air is drawn through the radiators by a fan and exhausted above the roof, the blast being used to draw the exhaust gases from the Diesel engine. In the stationary tests carried out on the test-bed at the Esslingen works, a thermal efficiency of as much as 27 per cent was obtained. The locomotive has an overall length of 11.2 m. (36-ft. 9-in.), an overall width of 3.21 m. (10-ft. 6-in.), an overall height of 4.66 m. (15-ft. 3-in.) and a weight in working order of 73.6 tons. The maximum speed is 60 km. (37.3 miles) per hour; the maximum tractive effort amounts to 17 tons, and the tractive effort, at hour-rating of the motors, to seven tons at 17 km. (10.6 miles) per hour.

Interesting British Pipe-Line in Japan

To engineers accustomed to laying air pipelines of the usual threaded type the fact that in Japan an air-line over a mile and a quarter long was laid by unskilled labour, and when tested had not a single leak, will sound like a fairy story. Such a line, however, is in operation at the Mitate Mine of Toyo Mines Ltd., near Tokyo, and is giving complete satisfaction. This pipe-line, of the special Victaulic type, supplied by the Victaulic Co., Ltd., is 6,736 feet in length, made up of 1,500 feet of 9-in. dia. pipe, 4,136 feet of 8-in. dia., and 1,100 feet of 7-in. dia., and extends from the compressor house to the present lowest working in the mine, the 550-ft. crosscut, which is 550 feet below the main Ogiri level. At this point a 3-in. dia. line is taken off into the 550-ft. crosscut and other workings, while the main air-line extends in a 6-in. dia. pipe for another 1,100 feet to the 250-ft. working level.



The 200-ft. span across the Hikonage River Gorge

Another 3-in. line is taken into this level, and the main line further extends as a 4-in. dia. pipe to the Ogiri level, a distance of some 1,200 feet. Here the main line divides into two branches or 3-in. dia. going to the Ogiri East and the Ogiri West workings respectively. The various working faces are fed by 1 and 2-in. dia. pipes from the 3-in. mains, and the mains are to be extended some 3,000 feet to cut the parallel Obuki workings. The total length of air mains will then be over 12,000 feet, while the smaller diameter branch pipes are also of considerable length. Air is supplied by two compressors exported by Belliss and Morcom Ltd., of Birmingham, which have a combined capacity of 2,400 cu. ft., and further compressors will be added to the plant as required.

The safety cut-off of the compressors is set to work at 87 pounds, and a gauge at the 550-ft. level, 6,736 feet from the compressors, shows a steady constant pressure of 85 to 86 pounds. This small difference, due to change in altitude and a small amount of friction, shows that the system is functioning excellently. In fact the line has been tested at 130 lb. pressure without a leak or a seepage of air being found. At one point the pipe-line, as shown in the accompanying illustration, crosses the gorge of the Hikonage River in a span of about 200 feet. Here it is suspended in mid-air from two steel wire ropes, and since the special Victaulic method of coupling permits a slight amount of play at the joints, the pipe follows the curve of the wire ropes, and it was not necessary to bend the individual lengths of pipe.

The Victaulic joint itself consists of two portions, an inner flexible ring and a metallic outer ring or housing. The inner ring is an adaptation to pipe joints of the principle of the U-washer familiar in hydraulic machinery, and consists essentially of a double U-washer the conical inner edges of which are of smaller diameter than the tube ends, on which they exert a slight pressure. Internal pressure from the main acts on the interior of the flexible ring, forcing its edges against the tube with a pressure that increases directly with the working pressure. Should the internal pressure become less than the external pressure the flexible ring adapts itself to the altered conditions and still seals the joint, which is thus proof against leakage from within or infiltration from without. The housing positions the inner ring accurately on the tube ends, supporting it closely so as to relieve it of all bursting stress, and also couples the tube ends positively.

At each joint the Victaulic coupling allows a small angular movement, varying from 5 degrees on small pipes to half a degree on large pipes, or a longitudinal movement of at least ⅛-in. This longitudinal movement provides for expansion and contraction in mains laid above ground, and for subsidence in buried mains, a feature unique in pipe joints. Steel tubes to be joined by the coupling may be either shouldered or grooved, the former being used with thin tubes and the latter for those of heavier gauge. The depth of the grooves is the same as that of ordinary pipe threads and does not appreciably weaken the pipe. Cast-iron pipes are supplied with shouldered ends for use with the housing type of joint.

Joint housings are supplied in various materials to suit different working conditions, the most common being of a ductile-and shock-resisting steel alloy, which has an ultimate tensile strength of from 22 to 24 tons per sq. in., and a minimum elongation of 6 per cent on a British Standard test-piece. Housings made from drop-forged steel of 28 to 32 tons per square inch tensile, or from material of a higher strength where exceptional stresses are to be withstood, are supplied for pressures up to two tons per sq. in., and are recommended for use on rising mains in pit shafts and similar situations. For cast-iron pipes the housings are made of a special quality of malleable cast-iron having an ultimate strength of 22 to 24 tons per sq. in., a high yield point, and such ductility that British Standard test bars can be bent cold through an angle of 180 degs. The only tool needed for completing the joints with these housings is a small spanner.

Made from a special rubber composition, the flexible inner rings are the result of many years of experiment and research. Two qualities are supplied, one, which is black in color, being for water and compressed air, and the other, colored red, for mineral oil or benzol. It must be emphasized that Victaulic joints are not suitable for use with steam. The latest type of joint, suitable for pressure or suction work, is being employed extensively for draining colliery workings where long lengths of suction main are required. Vibration tests carried out on Victaulic joints, in which each joint was moved several inches from the straight for many thousands of vibrations, showed no leakage in a closed vacuum of 28 inches of mercury.

Many special fittings have been designed for use with Victaulic tubes, including setting pieces; reducers, long and short; closer high-temperature flange joints, for use where the temperature exceeds 150 degs. F., as for instance between the compressor and the receiver on a compressed-air main; branch joints; shouldering tools; adjustable bends; blank ends; flange adapter joints; bulk-head adapters; grooving tools; and special hose couplings.

New Sungari Wharf

The Harbin Chamber of Commerce, the Binchang Transportation Association, and the Chambers of Commerce of various districts along the Sungari and Heilungkiang Rivers, realizing the need of a new wharf in the Binchang district, have leased a suitable piece of land, and a petition will be sent to the Administration asking for official approval of the scheme. Nine directors were elected to take charge of the plan, with the Chairman of the Binchang Chamber of Commerce, Mr. Chang Hsian-liang, as Director, and the Chairman of the Binchang Transportation Association, Mr. Yen Chin-ho, as Vice-Director.

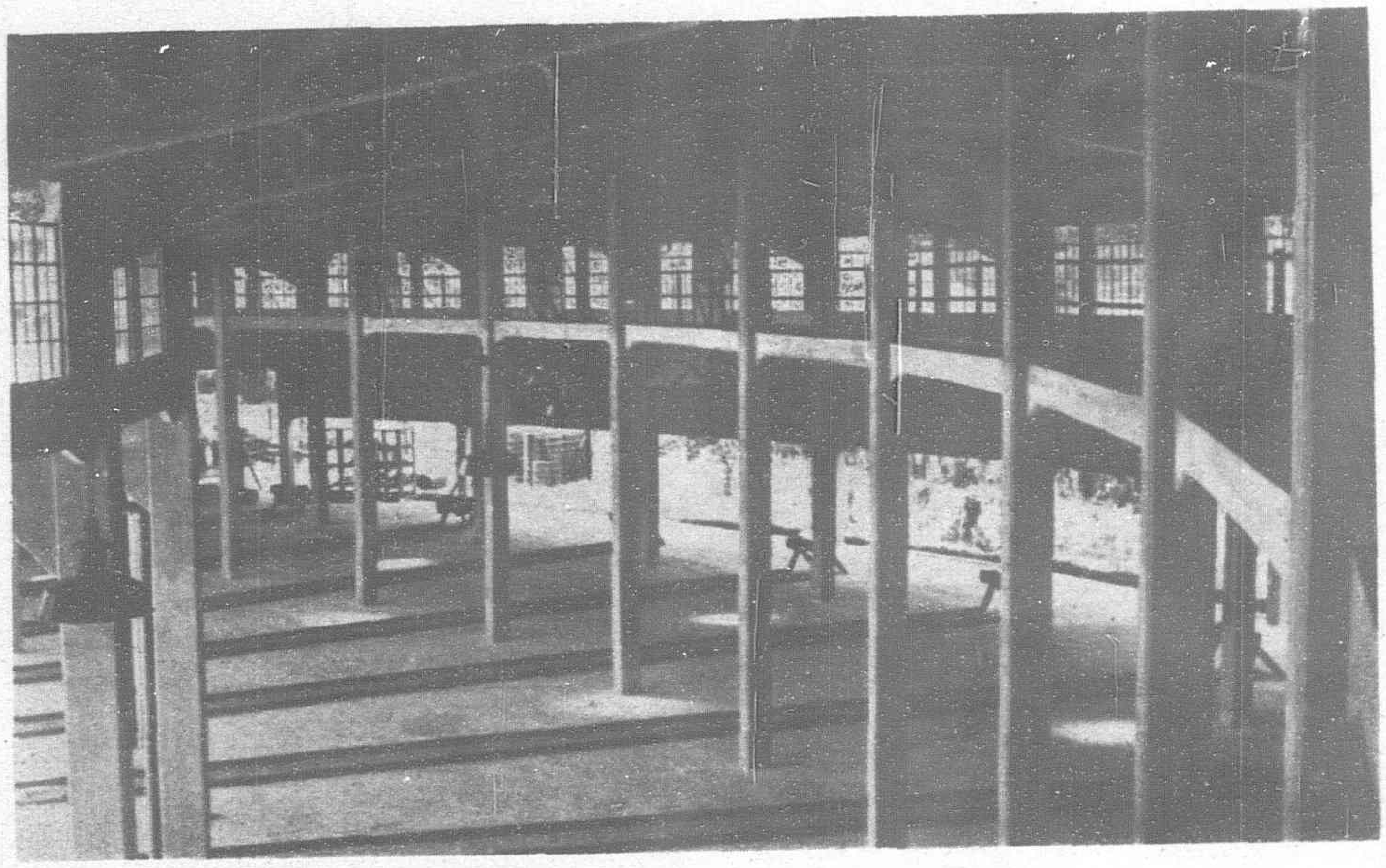
The site chosen for the wharf is between the Fifth and Seventh Streets. This will be the third wharf in Binchang, the other two being the North-eastern Navigation Company's Wharf and the Kwan Hsin Wharf.

Remodelled Locomotive Depot at Kuala Lumpur

By J. O. SANDERS

THE accommodation required at Kuala Lumpur for locomotives and carriages having outgrown the existing facilities it became necessary, in the year 1928, to arrange for a re-modelling of the present depôt. A triangular piece of ground, bounded by Damansara Road, Travers Road, and the main railway line, was available. After considering various schemes, it was decided that the Round House type of locomotive shed could best be fitted into the site, and at the same time it was decided to adopt mechanical plant for handling coal and ashes in order to reduce the amount of yard space required.

Accommodation for carriages being entirely insufficient, it was decided to hand over the present locomotive shed to be used as an extension of the present carriage shed, and to move the locomotives into the new Round House. Work on the new Round House and the equipment for the new Locomotive Depôt was commenced in 1929 and is now nearing completion.

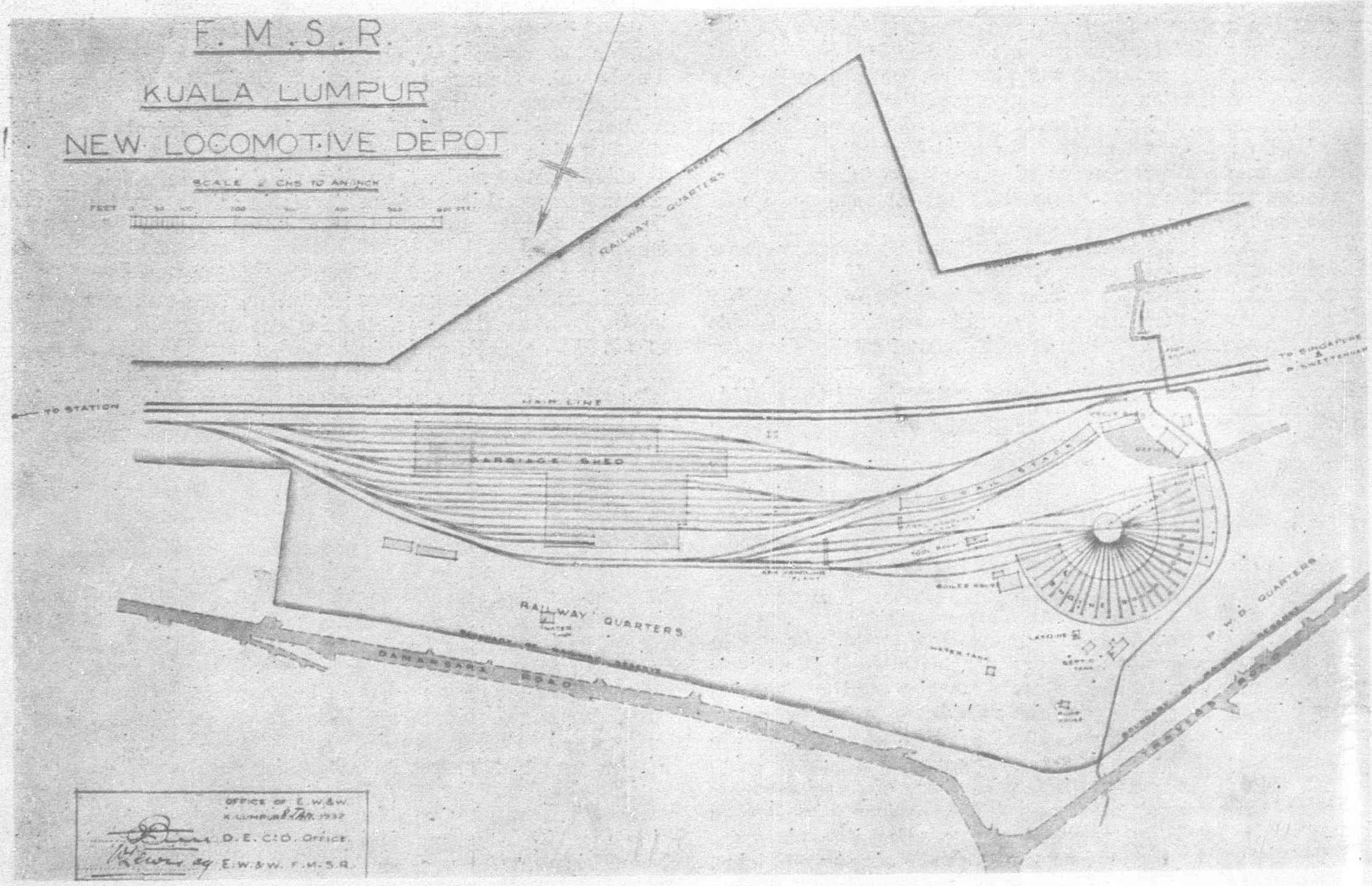


Interior of the Round House

The Round House building itself is constructed of re-inforced concrete to the designs of the Engineer for Way and Works. Following Indian practice—walls on the inner and outer circumferences of the shed have been omitted as, in this climate, they are considered to be unnecessary. The shed is well lighted, and the omission of these walls assists in this direction.

The advantage of the Round House type of construction from the working point of view lies in the fact that locomotives stand each on a separate road radiating from a central turn-table, thus each engine can be brought direct on to the turntable and so out of the shed; whilst in the rectangular type of shed, to take out a fourth engine on one road involves moving the three in front of it.

The new Round House has 28 roads of which two are in the repair shop. The number of locomotives passing through the shed during 24 hours is about 40, but the accommodation is sufficient for those which will be



within the locomotive depôt at any one time in the 24 hours. The shed, when completed, will be equipped with electrically operated apparatus for lowering locomotive wheels requiring attention. It will contain plant for hot water washing out of boilers and for holding locomotives in steam, ready for service, by means of a live steam main running round the shed and, in addition, will have the usual workshop, machinery, and store accommodation.

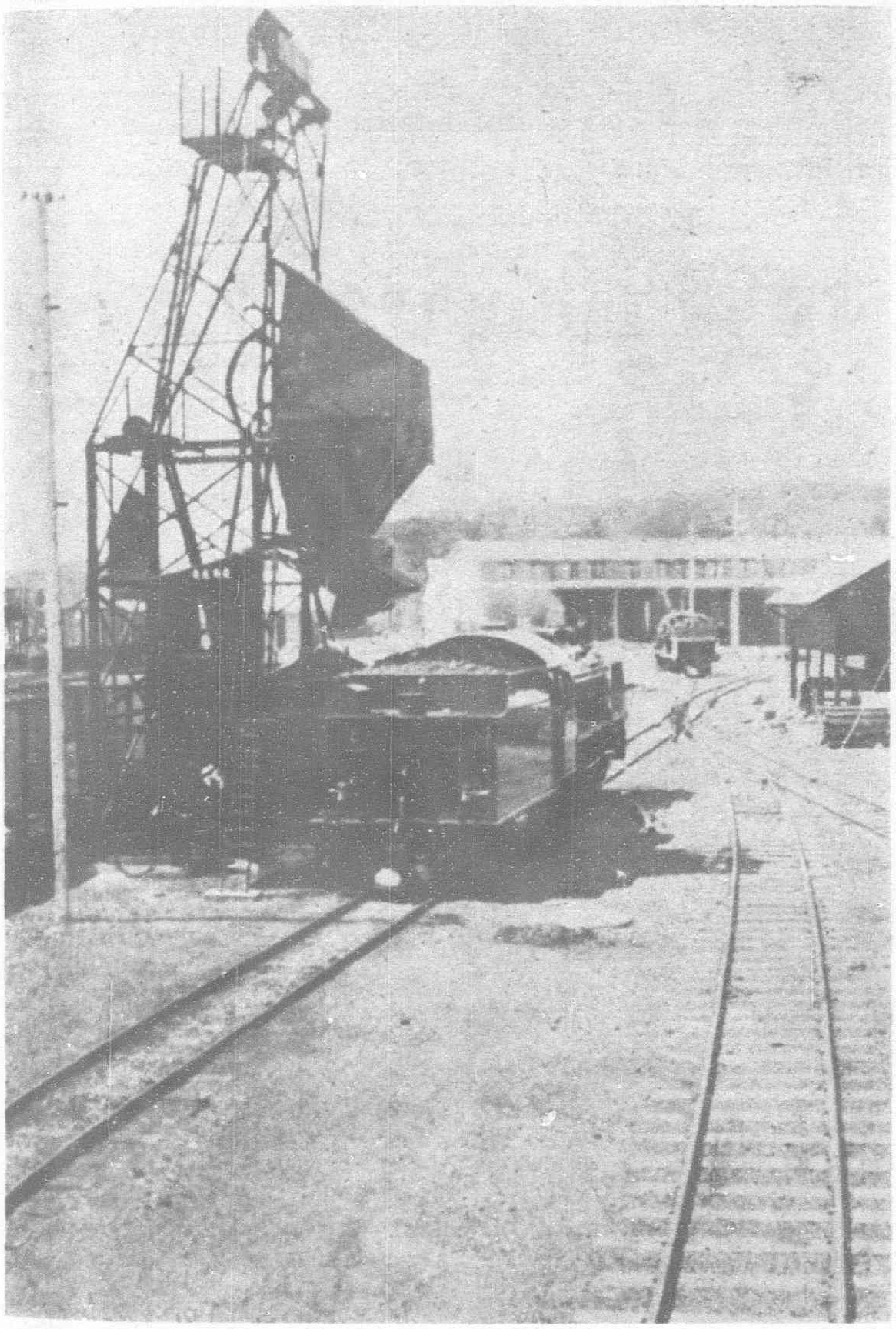
The locomotive yard contains a Mitchell coal handling plant. Coal is supplied to an underground hopper from 40 ton hopper wagons. From the underground hopper it is raised to an overhead hopper from which a locomotive can be supplied with five tons of coal in rather less than one minute.

On two of the roads leading into the locomotive shed Mitchell ash handling plant is provided. A locomotive placed over this plant drops the ash accumulated in the ash pan, fire-box and smoke box into an underground hopper from which the ash, after quenching, is lifted by mechanical means into wagons standing between the two lines.

The use of coal and ash handling plant effects considerable saving in labor costs.

The turn-table in the center of the new Round House is equipped with an electrically operated tractor. A locomotive can be placed on the turn-table and turned round in rather less than one minute.

It is expected this new locomotive depôt will be brought into use in the latter part of this year when the Railways expect to benefit by the better facilities for servicing and maintaining their locomotive stock in this district. The value of the locomotives passing through the shed in 24 hours will be about $2,000,000, which figure suggests how important it is that each locomotive should be passed through the shed and re-conditioned ready for further service in as short a space of time as possible, so that the greatest amount of work per locomotive may be obtained.



The Coal Handling Plant

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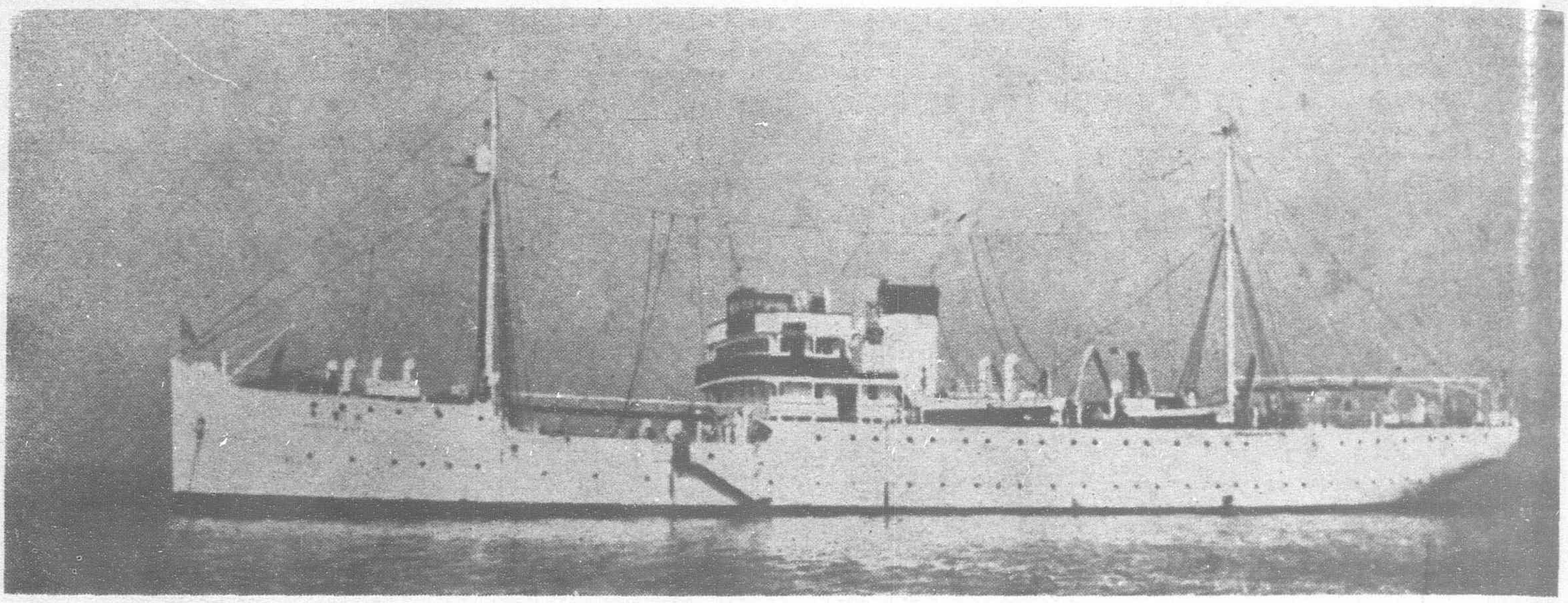
The Ash Handling Plant

British Locomotives for China

There have recently been put into service on the Peping Liaoning Railway, six Mikado (2-8-2)-type standard-gauge locomotives, built by the North British Locomotive Co., Limited, of Glasgow, to the order of the Kailan Mining Administration of China. These locomotives have cylinders of 21-in. dia. and 28-in. stroke. The leading bogie, coupled and trailing bogie wheels are 3-ft. 1½-in., 4-ft. 6-in. and 3-ft. 7-in. dia. respectively, while the rigid wheelbase is 15-ft. and the total wheelbase 31-ft. 4-in. The total heating surface (2,726 sq. ft.) is made up of :—tubes (small) 1,256 sq. ft., tubes (large) 705 sq. ft., firebox 140 sq. ft., firebox (syphons) 42 sq. ft., and superheater 583 sq. ft. The firegrate has an area of 41.4 sq. ft., and the boiler working pressure is 180 lbs. In working order, the engine has a weight of 84 tons 5 cwt., of which 62 tons 1 cwt. are carried on the coupled wheels. The tender—carried upon two four-wheeled (2-ft. 9-in. dia.) bogies—has 450 cu. ft. (10 tons) of fuel space, a tank capacity of 5,000 gall., and weighs (full) 59 tons 19 cwt. The tender has a wheelbase of 18-ft. 7-in., and the engine and tender a wheelbase of 59-ft. 1½-in. The Westinghouse brake is fitted to both engine and tender, and the special equipment of these locomotives includes mechanical stoking apparatus.



The Japanese Fisheries Vessel "Hakuyo Maru"

Recent Development of Fisheries Motor Craft in Japan

By Y. TAJI, M.I.N.A., M.I.Mar.E.

(Continued from January Issue)

THE fisheries training and investigation Motorship *Hakuyo Maru* built for the Imperial Japanese Fisheries Institute is rated as the world's most modern fisheries craft, carrying unique equipment for actual sea training of undergraduates of the Imperial Fisheries Institute and for the exploration of new fishery zones as well as for improvement of fishing methods and investigation of artificial treatment of fishes and marine products.

The vessel has proved her effectiveness for the aims with satisfactory performance at sea, after actual experience on her maiden voyage of over 12,000 nautical miles in the South Seas and Indian Ocean.

The vessel is of a well and long poop type, built in the Kawasaki Dockyard of Kobe, and is classified by the Japanese Government as a "First Class Ocean Fisheries Ship."

The principal particulars are as follows :—

Length between perpendiculars	225-ft. 0-in.
Breadth moulded	36-ft. 0-in.
Depth moulded	20-ft. 0-in.
Draught	15-ft. 6-in.
Gross tonnage..	1,328 tons.
Sea speed	13½ knots.

Propelling machinery :—

Two sets of four cycle airless injection Diesel engines of the Kobe Steel Works type.

S. H. P.	1,400
Number of propellers	2
Complement :—	
Officers and men	59
Students	50
Total	109

General Arrangement and Special Features

The vessel having been built for the special purposes as prescribed, her navigating sphere extends over the extreme cold and tropical districts, so that the special construction and equipment are adapted to withstand two extreme limits of the climatic conditions.

The internal arrangements have many special features, unlike ordinary cargo or passenger ships, such as numerous student's cabins and living rooms, spacious reading rooms, a lecture hall and dining-room, a research laboratory for study of fishes and marine products, a specimens room, the rooms of instructing officers for the fishery, manufacture and biology, workshops for canning and for manufacturing fish provisions, etc.

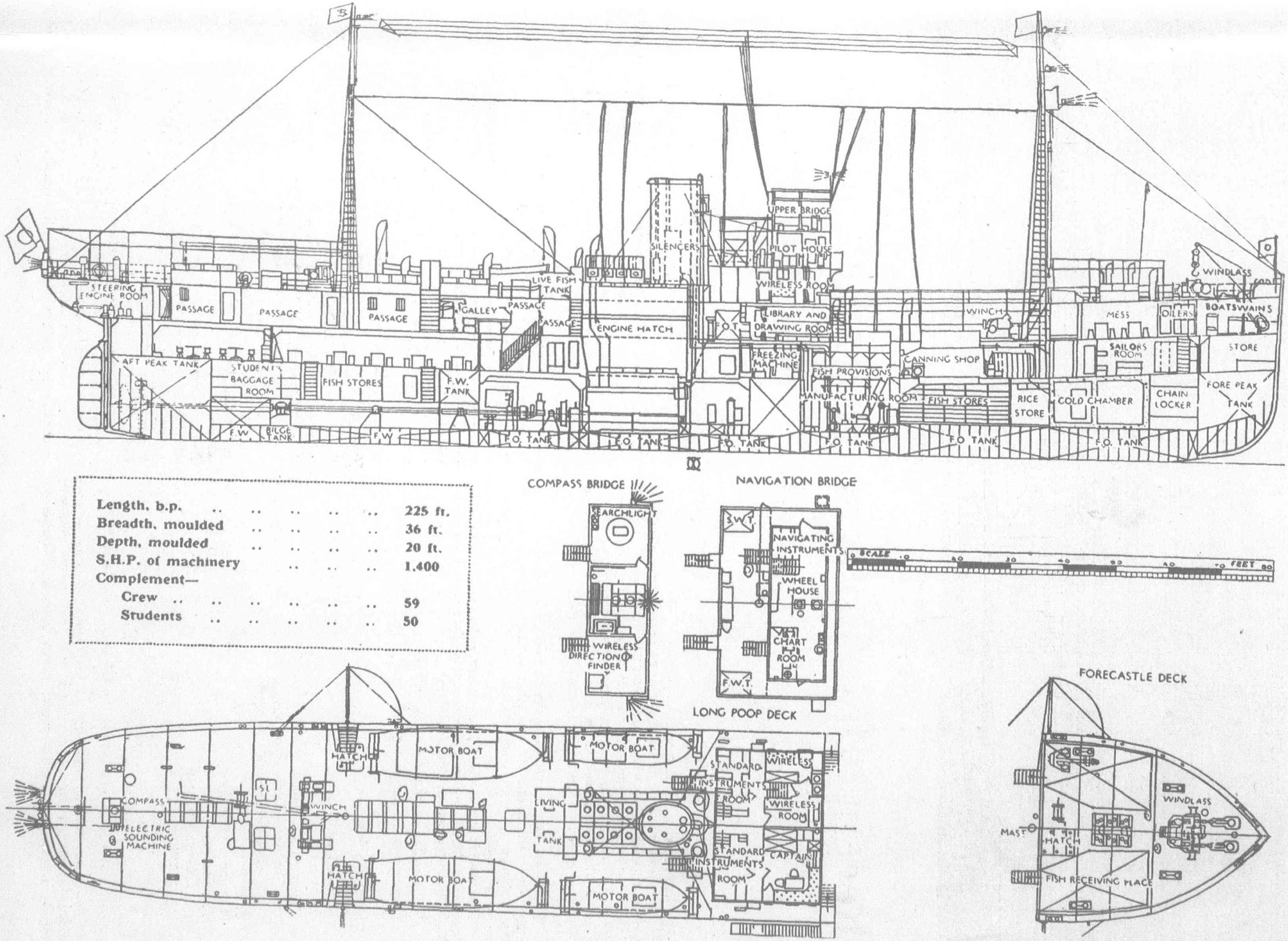
In the canning shop on the second deck under the foremost hatchway are two sets of semi-automatic can-making machines, a can-washing machine, a sterlizer, a can-seaming machine, a double boiler, conveyers and elevators. The can-making machine has a capacity of manufacturing 10 cans of one pound and of a half pound content per minute, whilst the washing machine can deal with 100 cans per minute. All these machines are of Japanese make.

The fish-meats manufacturing room extends to the hold from the second deck and is provided with all necessary equipment for complete fish meals manufacturing and fish oil extracting plant, including fish transporters, boiling apparatus, squeezers, dryers and heaters and has a capacity of handling one ton of raw fishes per hour, the machines being operated by electric motors of 20 and two horse-powers. The oil extracting plant has a capacity of extracting fish oil of 150 gallons per hour, and is provided with a strainer, a centrifugal oil separator, a heater, etc.

The refrigerating compartment is situated in the forward part of hold, and comprises a cold storage chamber, a frozen storage chamber and a preparation chamber. The capacities of the cold chamber, frozen chamber and preparation chamber are 1,600, 420 and 250 cubic feet, respectively, totaling 1,870 cub. ft. The refrigerating machine is of the Kobe Steel Works' ammonia compression type of 60,000 B.T.U. installed on the second deck adjacent to the fish-provisions manufacturing room.

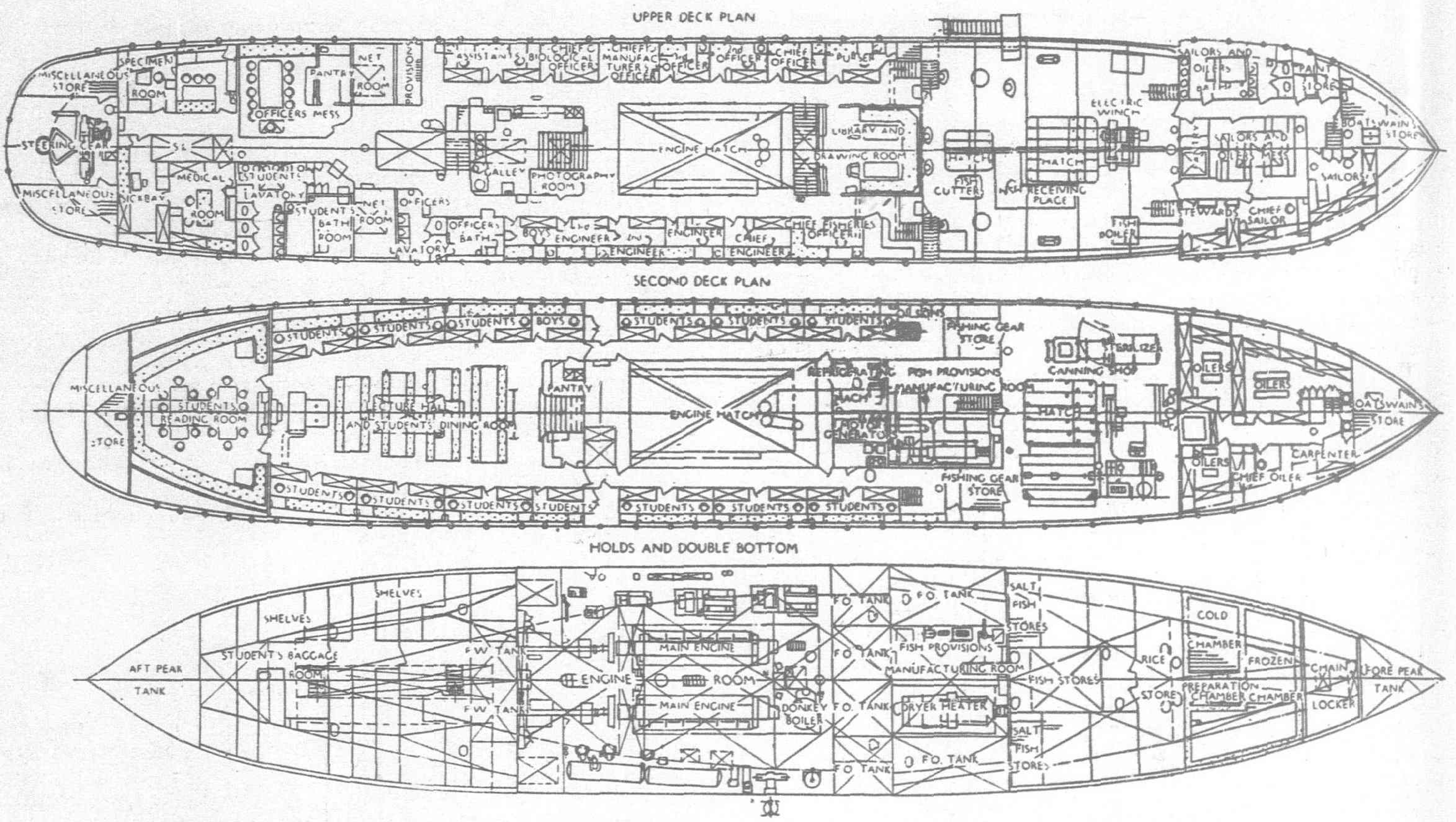
All deck machinery is electrically driven, comprising one 20 kw. windlass, one 26 kw. winch, two 13 kw. winches, etc. The handling of boats is carried out with a 13 kw. winch through fair-leaders.

The navigation appliances are so complete, as to comprise a Brown's A type gyro-compass and repeaters, steering repeaters,



Length, b.p.	225 ft.
Breadth, moulded	36 ft.
Depth, moulded	20 ft.
S.H.P. of machinery	1,400
Complement—	
Crew	59
Students	50

General arrangement of the Fisheries Training Ship "Hakuyo Maru"



General arrangement plans of the Japanese Government Fisheries' Training Ship "Hakuyo Maru"

correction repeaters, a course recorder, an Admiralty type 4,500 fathom echo sounding machine, a Sal log, an electric log, a Telefunken direction finder, telemotors, Hele-Show's electric-hydraulic steering gears, etc.

The wireless telegraphy and telephony apparatus was supplied by the Nippon Wireless Telegraph and Telephone Co., Ltd., and is of a standard valve system with aerial currents of 500 w. and 250 w., hearable distances of 400 kilometers and 100 km. for the telegraph and telephone, respectively. The receiver is of an intensifier type of one stage for the high frequency and two stages for the low frequency, and can receive both telegraphic and telephonic waves. The electric sources consist of a motor-generator, a ½ kw. spare motor-generator with secondary batteries and an auxiliary generator.

The Western Company's automatic exchange telephones are fitted to the captain's room, engine room, chief mate's room, chief engineer's room, first engineer's room, wireless telegraphy room, chief fisheries officer's room, chief manufacturing officer's room, chief sailor's room, canning shop, fish-provisions manufacturing room, etc. Watertight telephones in direct communication with the wheel-house are fitted to the watch platform, the fore end of the forecastle deck and stern part of the poop deck.

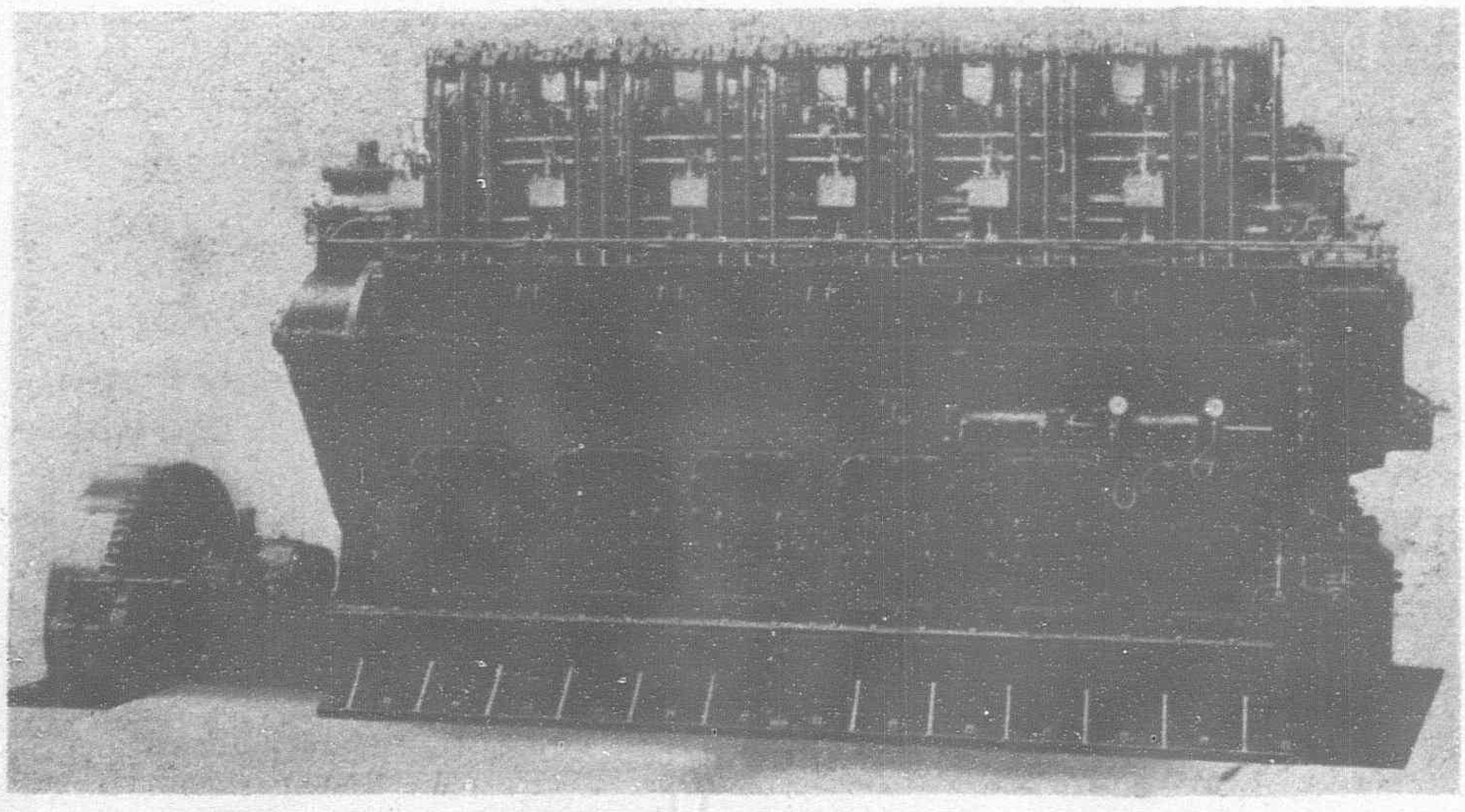
A powerful Sperry's searchlight and a range finder are installed on the wheel-house top.

Necessary instruments for oceanological and biological research, a high speed moving picture machine, etc. are also provided.

For the handling of fishes, about 216 sq. ft. of the starboard aft part of the forecastle deck is arranged for the fish take-in space, the side rail being detachable for about six feet length. A wooden fish transportation slide is provided from this space to a steam-heated boiling tank on the well deck. A 1½ ton derrick is also fitted on the forecastle deck to handle caught fishes and fishing nets.

It should not be overlooked that the vessel is provided with four motor fishing boats of pinnace type, two of them being 32-ft. long and others being of 23-ft. These fishing boats are propelled by a Kermath oil engine and are equipped with a warping capstan, driven by the propelling engine, for handling ropes and fishing nets.

The boat lifting devices are also of an entirely new design. In ordinary devices, the lifting ropes slacken when the boat is raised by waves, whilst a sudden pull is exerted to the ropes when the boat falls towards wave trough, resulting often in breaking of the ropes. Consequently, it was extremely difficult to lift boats when the sea was rough. In the *Hakuyo Maru*, the lifting machine is specially designed to be increased in winding speed automatically, if the ropes are slack, thus keeping them always under tension.



A new type of Japanese engine installed in the "Hakuyo Maru"

MAIN ENGINES AND AUXILIARIES

The main engines comprise two sets of Kobe Steel Works' four cycle airless injection Diesel engines of type 6Vr42, the diameter of cylinders being 420 mm., stroke 640 mm., and the normal output 700 s.h.p. at 210 r.p.m. The overload capacity is 20 per cent with three hours endurance, while at 10 per cent overload, continuous running is possible.

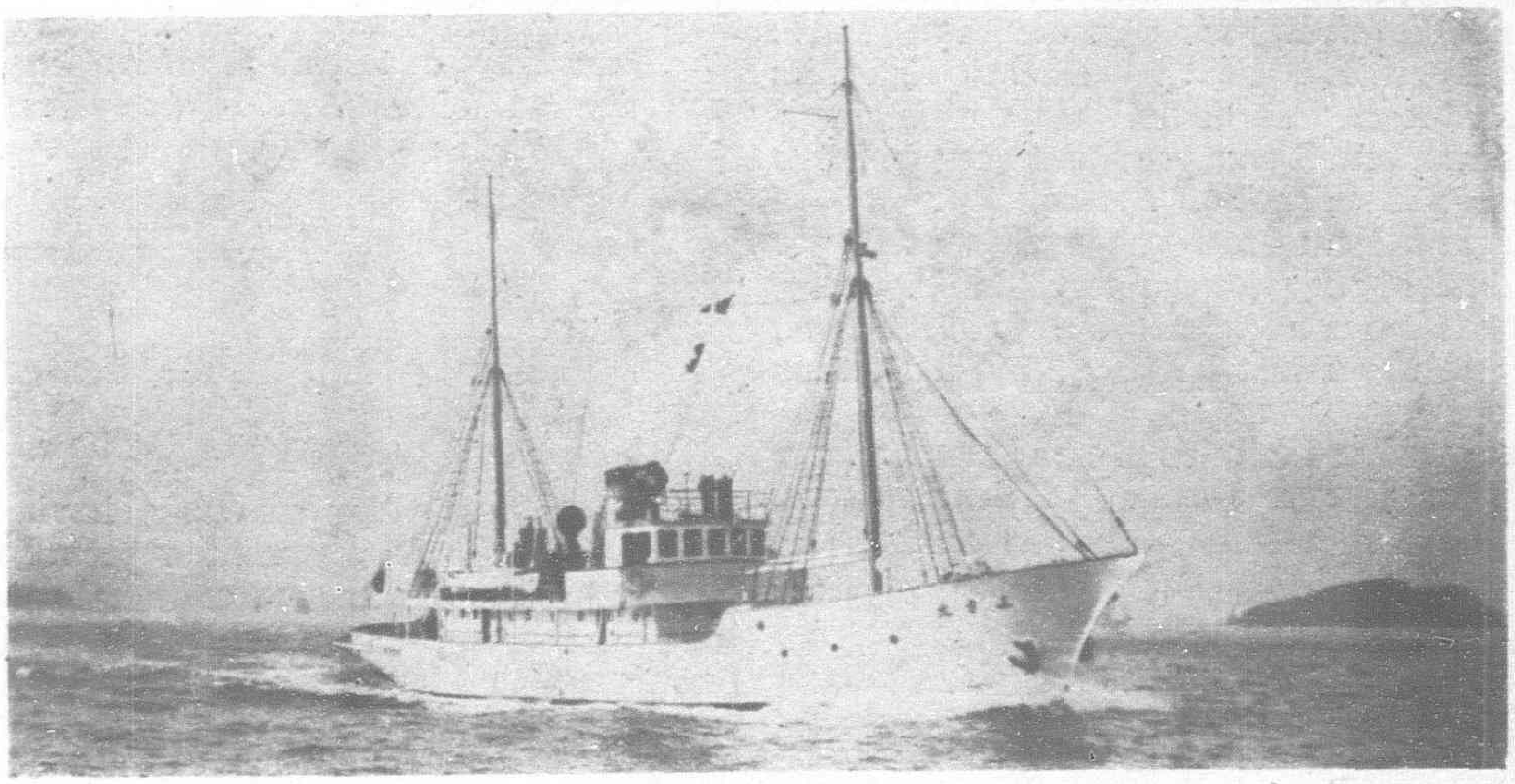
The engines are of a trunk piston type,

fuel oil being injected to the cylinders under the direct forced system at a pressure of 320 kgs. per sq. cm. through nozzles with six holes. Special care was taken for design and construction of the fuel valve in order to minimize wearing of the valve seat and to anihilate carbonized deposits of fuel oil around the nozzle. Very low grade fuel oil is suitable for these engines and preheating is not necessary even in very cold weather. Although an interchanging device to petroleum is provided, its use has been hardly necessary.

The cylinders are of special cast iron, six in number, two each being cast together and fastened with screw bolts. The frame and bed plate are separately cast, but are rigidly fastened to the cylinder blocks by long stay bolts, so as to minimize the effect of stresses due to combustion to the engine structure and to reduce the weight of engine whilst the structure is considerably reinforced.

The pistons comprise upper and lower sections, the upper one being of well forged Siemens-Martin steel, while the lower is of special cast steel. No piston cooling device is provided, yet not the slightest danger has been experienced even at 20 per cent overload.

The starting of the engines is executed by turning the starting handle to "on" position and opening automatically air valves. When the handle is put to the working position, the engine starts combustion and at the same time the main air valves close automatically, resulting in natural escape of air in pipes, so that the operation is done very quickly without slightest anxiety for careless handling. The turning of the engines is effected by a motor, and a safety device is provided not to supply starting air to the engine if the turning gear is in action, even when the starting handle is turned on.



The "Fuso Maru"

All necessary manoeuvering apparatus including various indicators, fuel oil regulators, timing regulators, starting and reversing handles are assembled on the front of the engine, so as to be under entire control of one engineer.

The reversing of the engine is effected by a servo-motor operated by compressed air, a hand pump being also provided as the auxiliary device. The operation is simply turning a control handle to the ahead or astern position, as all other remaining actions are automatically done.

Each cylinder has a fuel oil pump and a handle for regulating the fuel supply in accordance with load. These fuel pumps are detachable for repair even while the engine is running.

All auxiliary pumps necessary for driving the main engines are directly connected to the engines and are assembled on the front of the engines for convenience of easy inspection. These comprise a cooling water pump with a capacity of 35 cub. meters per hour, a bilge pump of the same capacity, a lubricating oil pump of 7.3 cub. m. per hr. and a cylinder oil pump of Fisher's type 0.12.

The thrust bearing is of the Kobe Steel Works' single collar pivot type, a fly wheel being fitted behind this bearing.

The propellers are of manganese bronze with four blades turning outwards, the diameter being 7-ft. 9-ins., pitch 7-ft. 2.4-ins., developed area 17.2 sq. ft.

The main electric generators are installed in the engine room and comprise two sets of 50 kw. D.C. dynamos driven by 75 b.h.p. airless injection Diesel engines, supplying current to some 30 electric motors on board the ship. Further, one set of 10 kw. Diesel dynamos of the same type is installed for supplying current to motors smaller than 5 h.p. and also for the lighting of the ship when in port.

The starting air compressors are driven by 35 h.p. electric motors, each having a capacity of 90 cub. meters per hour at 30 kgs. per sq. cm. Four air reservoirs of 2,000 litres each, at 30 kgs. per sq. cm. being provided, the engines can be started more than fifty times. Further, three air reservoirs of 70 litres each, at 30 kgs. per sq. cm. are arranged in the engine room for the main Diesel generators and emergency generator, and also a small air bottle of 0.3 cb.m. at 15 kgs. sq. cm. is provided for a "Typhone."

An emergency air compressor of 8 cub. ft. is also provided in order to supply air when the main compressors are out of order.

Various auxiliaries in the engine room, other than those prescribed are as follows :—

1—Centrifugal ballast and bilge pump, with a capacity of 50 tons per hour at a water head of 55-ft. driven by a 9 h.p. electric motor.
1—Fire and general service pump of 80-30 tons per hour at 55-150-ft. head with a 14 h.p. motor.
1—Sanitary pump of 15 tons at 90-ft. head with a 5 h.p. motor.
1—Oil transfer pump of 15 tons at 50-ft. head with a 5 h.p. motor.
4—1½ ins. hand pumps for fuel oil, fresh water and light oil.
1—Sharples oil purifier, type No. 5A.
1—Cylindrical donkey boiler of 5-ft. in diam., normal steam pressure 80 lbs. per sq. ins.
1—Oil fuel burning set.
1—Feed pump.
1—10 ton evaporator and distiller.
1—Electric syren with a 3 h.p. motor.
2—Silencers for the main engines.
2—Silencers for the main Diesel generators.
1—Silencer for the emergency Diesel generators.
1—Main and auxiliary switch-boards.

Machine tools such as a 6-ft. lathe, an electric drilling machine, vise bench, etc. are arranged in the engine room for repair work.

Various tanks in the engine room are as follows :—

1—750 litre cylinder oil tank.
1—500 litre engine oil tank.
1—200 litre compressor oil tank.
2—5 ton light oil tanks.
1—1½ ton light oil tank.
1—90 litre light oil ready use tank.
1—½ ton fuel oil tank for the donkey boiler.
2—180 litres each, lubricating and fuel oil heating tanks.
2—2 ton fuel oil ready use tanks.
2—20 ton fuel oil settling tanks.
1—½ ton purified fuel oil tank.
1—250 litre observation tank.
1—½ ton feed water tank.
1—3 ton lubricating oil tank.
1—75 litre fuel oil drain tank, etc.

RESULTS OF TRIALS

In order to investigate the accurate characteristic and the performance of the main engines, very elaborate tests in shop and trials on sea were carried out.

(I). *Shop Tests.*—These tests consisted of the full power 24 hours continuous running trial, ¾ full power 12 hours continuous running trial, 10 per cent overload trial for five hours, 20 per cent overload trial for one hour, tests for the lowest revolution, starting and reversing, etc.

The results are as shown in Table I.

TABLE I.—SHOP TEST RESULTS

Load	—	*4/4*	*3/4*	*10 % Overload*	*20 % Overload*
Duration of trial (hours) ..	—	24	12	5	1
Mean R.P.M.	—	212.2	193.2	216.5	222.1
B, H. P.	—	711.4	531.9	775.9	840.1
Fuel (per hour per I.H.P.) ..	gr.	137.1	133.9	141.6	143.6
Cooling water pressure..	..kg./cm.²	0.35	0.31	0.384	0.43
Lubricating oil pressure.	..	1.06	1.03	1.06	0.99
Maximum pressure ..	..kg./cm.²	42.6	45.2	41.9	41.2
Mean effective pressure	..	6.80	5.534	7.27	7.65
Mean I.H.P.	—	853.8	630.4	933.5	1,004.2
Mechanical efficiency . ..	—	83.4	84.2	83.0	83.7
Thermal efficiency	—	36.8	38.1	35.5	35.3
Cooling water per hour per h.p.	—	29.38	30.9	32.2	37.0

Fuel oil used was Taracan heavy oil of the following properties :—

Viscosity—323 4/5 seconds at 15 degrees Centigrade by Redwood viscometer.

Specific gravity—0.94 at 20 deg. C.

Flashing point—115 deg. C.

Heat value—10.452 kg. calories.

Reaction—neutral.

Chemical analysis—C 84.94 per cent, H. 14.35 per cent, S 0.21 per cent, O 2.31 per cent, N. 0.16 per cent and asphalt 0.03 per cent.

In the starting test in shop, one 400 litre air reservoir was used. After starting the engine, the original air pressure of 30 atms. went down to 28 atms., while at sea trials, 2,000 litre air reservoirs were used at 31 atms. and the engines of both sides were simultaneously started and reversed, and it was possible to carry on the operation until the pressure was reduced to 7 atms.

The lowest revolution in the shop test was decided as 79 per minute and the effective limit of the governor to be 240 r.p.m.

The weight of one set of the main engine proper is 48,850 kgs., the fly wheel 3,000 kgs. and the thrust bearing 2,850 kgs., thus weighing in total 54,700 kgs.

The fuel consumption was less than 165 grams per s.h.p. per hour and quite high mechanical and thermal efficiencies were recorded.

TABLE II.—SEA TRIALS

	Full Power Trials.						*Progressive Trials.*					
Trial	*7-hour Continuous*		*Mile Trials*		*185 r.p.m.*		*20 % Overload.*		*155 r.p.m.*		*Low Power.*	
Engines	P.	S.	P.	S.	P.	S.	P.	S.	P.	S.	P.	S.
Speed, knots ..	—	—	13.29		11.99		13.88		10.28		6.96	
R. P. M. . ..	211	212	212	213	185	186	222	222	155	154	100	101
Slip %	—	—	11.73	12.18	8.75	9.27	11.96	11.96	6.67	6.08	1.95	2.97
M. I. P. mean, kg./cm.² ..	6.90	6.56	6.95	6.55	4.93	4.66	7.87	7.49	3.64	3.28	1.62	1.67
I. H. P. .	860.6	822.6	871.5	825	539	513	1,032	932	334	299	96	100
I.H.P. total ..	1,683.2		1,696.5		1,052		2,015		633		196	
S.H.P	1,393		1,404		889		1,708		—		—	
Mechanical efficiency % ..	82.8		—		84.5		84.8		—		—	

Mean draught, 11-ft. 2-in. Displacement, 1,485 tons. Midship area, 364 sq. ft. Length, 225-ft. Beam, 36-ft. Oil used, Tarakan with sp. gr. 0.93.

(II). *Sea Trials.*—The official full power trial, progressive trials, overload trial, etc., were carried out on the Inland Sea. At the full power trial, a mean speed of 13.296 knots was recorded with total mean i.h.p. of 1,696.5 and b.h.p. of 1,404 at 212.5 r.p.m., whilst at the 20 per cent overload trial, a mean speed of 13.886 knots was obtained with mean engine output of 2,015 i.h.p. and 1,708 b.h.p. at 222 r.p.m.

The details of the trial results are as shown in Table II.

ACTUAL EXPERIENCE AT SEA

The vessel has recently completed her maiden voyage of over 12,000 nautical miles cruising round the Western Pacific Ocean, China Sea, South Seas, Indian Ocean, Bay of Bengal, etc.

After this long voyage, the captain of the *Hakuyo Maru* has been strongly impressed with the advantage and convenience of Diesel engines for ships serving the duties and purposes imposed upon this vessel. He considers that in the delicate manoeuvering of the ship, special care would be necessary for a Diesel engined ship in view of the difficulty of running at dead slow speed, yet the facility of immediate starting of the engines, without a long warming-up as in steam engines, is most important in this class of vessels under special mission. In a steamship, it would be impossible to engage, under great ease and confidence, with such work as stretching fishing ropes after lowering motor boats and warping fishing nets amongst the strong currents near Atol, or handling drifting nets, for salmon and trout on the Northern Seas amongst raging waves with furious wind or in dense fog.

The vibration of the ship has been practically nil and the navigation was very pleasant and comfortable. This is due to the fact that the hull is subdivided by numerous longitudinal and transverse bulkheads into many compartments and is constructed substantially at bottom. However, too much reinforcement of the bottom part of Diesel engined ships will increase the rolling due to the bottom heaviness, and this vessel has slightly this tendency. This consideration should be taken into account as a reference in case of revising the shipbuilding regulations and also to naval architects.

In consequence of the size of this vessel, great difficulty will be experienced in the operation amongst monstrous waves of the strenuously rough North Pacific or North Atlantic Ocean in Winter time, but various latest navigation appliances fitted on board will considerably reduce the danger of navigation. It was, indeed, the Telefunken direction finder, Brown's gyro-compass and the Admiralty echo sounder, which served to find out the light of Ocshow, Cape of Robacca and St. Paul Island where seals were crowded, when the astronomical observation was impossible for several days in very dense fog and under furious storm, and it strongly confirmed the importance of the latest navigation instruments in conjunction with the skill of mariners, for the safe navigation of Diesel engined ships and in carrying on the duties imposed upon.

Osaka Launches Sewerage Project

(*From the Osaka Mainichi*)

The Municipality of Osaka having obtained under date of October 23 the Government approval to float Y.2,189,070 loan, will embark during the current fiscal year on the construction work of a modern sewage system in the central and northern business sections of the city.

It is a five year program, calling for the total outlay of Y.17,000,000, of which Y.12,101,400 will be raised by floating loans and the balance to be defrayed by levying taxes on the beneficiaries. The City intends eventually to modernize the entire sewage of the city.

The central portion of the city where the modern sewer mains are to be laid out, extends from Otemae down the southern bank of the Dojimagawa and as far west as the east bank of the Kizugawa. It will be bounded on the south by the Kansai main line of the Government Railways. The district embraces the total area of approximately 4,240,000 tsubo, or 3,465 acres.

The septic compartments, or cesspools for disposing of the sewage from this particular district will be established at Tsumori and along the banks of the Kizugawa, where after going through purifying processes the sewage will then be dumped into the river.

The northern portion where the city intends to lay out modern sewer mains, will be bounded on the south by the old Yodogawa bed, the Dojimagawa, and Ajigawa, and on the north by the Shinyodogawa, and covers an area of some 3,040,000 tsubo, or 2,450 acres.

The districts where the City plans to build modern sewer system, have the combined population of 1,185,000. The sewage collected will be conducted into septic compartments, where two species of bacteria with the aid of accelerating chemicals will do the purifying operation.

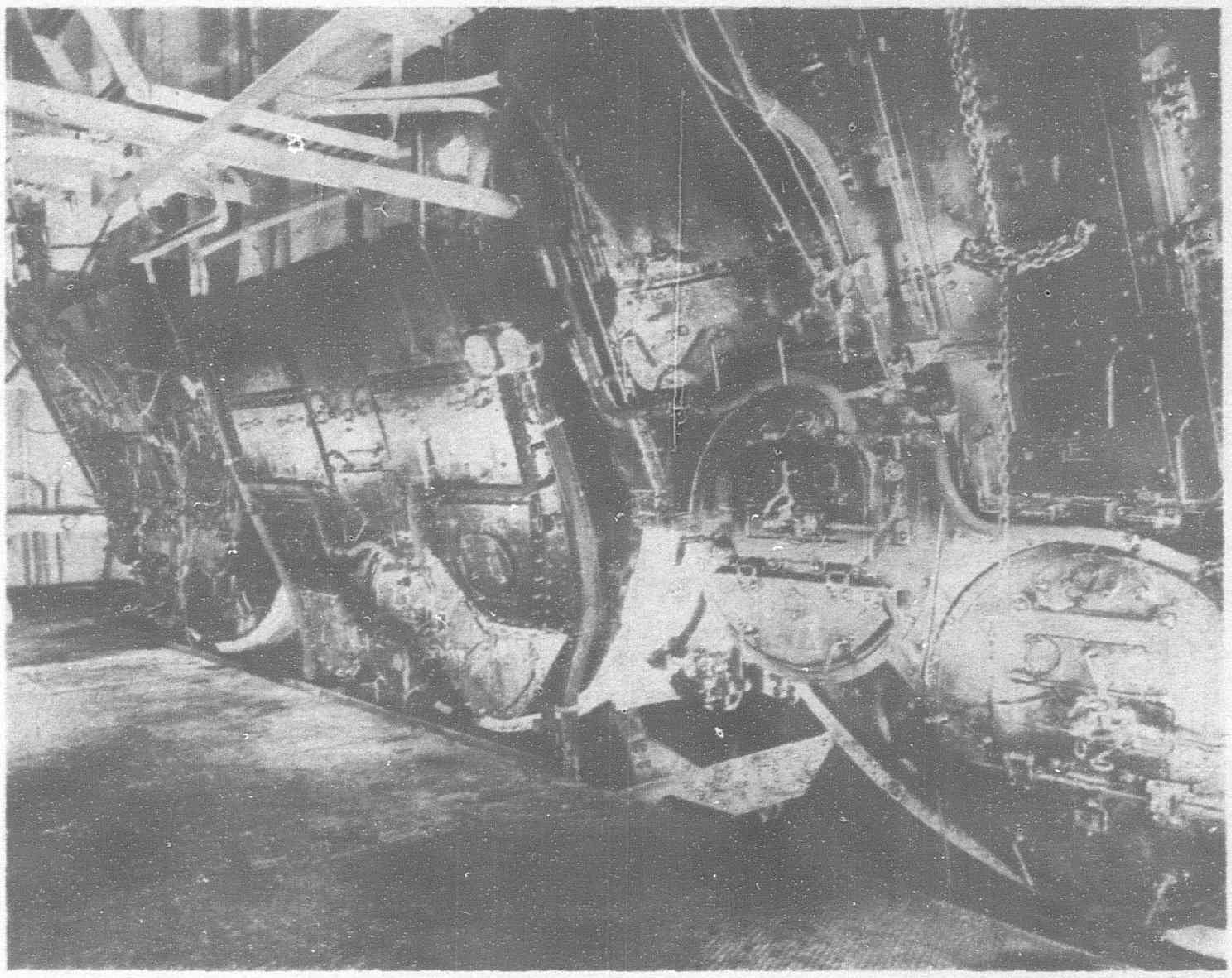
The matter of taxing the beneficiaries, the first of its kind in Japan, will shortly be promulgated by a special City Ordinance. Briefly, City will make it compulsory for the inhabitants or householders of the districts, to construct flush lavatories by the time the five year construction program is completed. By so taxing, the City intends to raise an annual revenue of some Y.1,000,000 which will be applied to redeeming the loans.

Yokohama Dock Company has New Combined Gas and Oil Burning Boiler

By Y. TAJI, M.I.N.A., M.I.Mar.E.

A NEW interesting type of combined exhaust gas and oil fuel burning boiler has been developed by the Yokohama Dock Company of Japan, one of which was installed in the Motor Tanker *Teiyo Maru*, with entirely satisfactory results, for the heating, cooking and supplying steam to auxiliary machinery at sea.

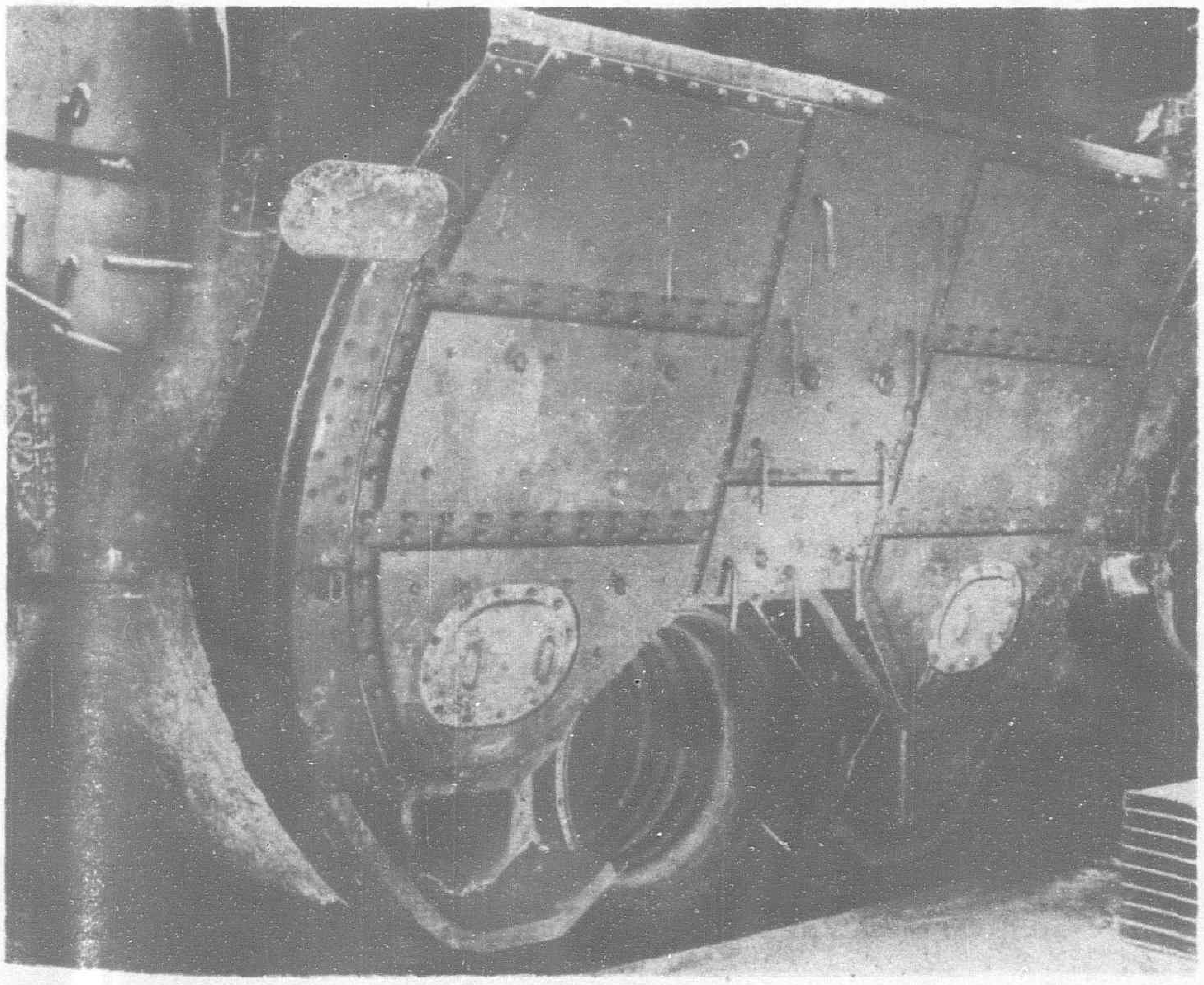
The boiler has three separate divisions, comprising two passages of exhaust gas at wings and an oil burning unit at center with a furnace, a combustion chamber and return tubes. Exhaust gas from each main engine is led through wing tube nests of the boiler, resulting in the generation of steam by the waste heat, whilst oil can be fired at the central furnace to augment the steam generation in case of necessity or for harbor service. The principle is orthodox and the construction is simple.



Boiler of the Motor Vessel "Teiyo Maru" middle boiler is of the Combined Exhaust and Oil Burning type. The sides are Ordinary Oil Burning Donkey Boilers

The boiler is of a cylindrical smoke tube type with a mean diameter of 10-ft. 6-in. and a length of about 8-ft. 1½-in. The compartment of exhaust gas passage has a single flow tube nest with a total heating surface of some 1,800 sq. ft., while the oil firing division consists of a corrugated furnace of 2-ft. 11-in. internal diameter, a Yokohama patent combustion chamber surrounded by fire bricks containing vertical water tubes, and a horizontal water drum connected to the boiler body and the vertical water tubes to augment the circulation of water.

All parts of the boiler body except tubes are of mild steel, and special care is taken for the workmanship in finishing all plate edges by planing or chipping and thoroughly caulking outsides and insides of all plate joints in order to ensure perfect water and steam tightness.



Front view of Patented Yokohama Exhaust Gas Boiler

The boiler is constructed under the survey of "Teishinsho" (Marine Affairs Bureau of the Ministry of Communications) and Lloyd's for a working pressure of 120 lb. per sq. in. and is water-tested to 230 lb. per sq. in.

Smoke tubes are plain seamless steel tubes of 3-in. external diameter with a thickness of No. 7 L.S.G., swelled at front ends and screwed into the fore and aft tube plates, stay tubes being of the same diameter with an ample thickness fitted in the same way. Water tubes are of seamless steel with an external diameter of 1¾ inch, expanded at the water drum and at the end plate of boiler body. The water drum is connected to the boiler shell by two communicating pipes, to which shut-off valves with drain cocks are fitted. As is the usual practice, longitudinal stays are fitted to the end plates with fine threads and nutted at both ends.

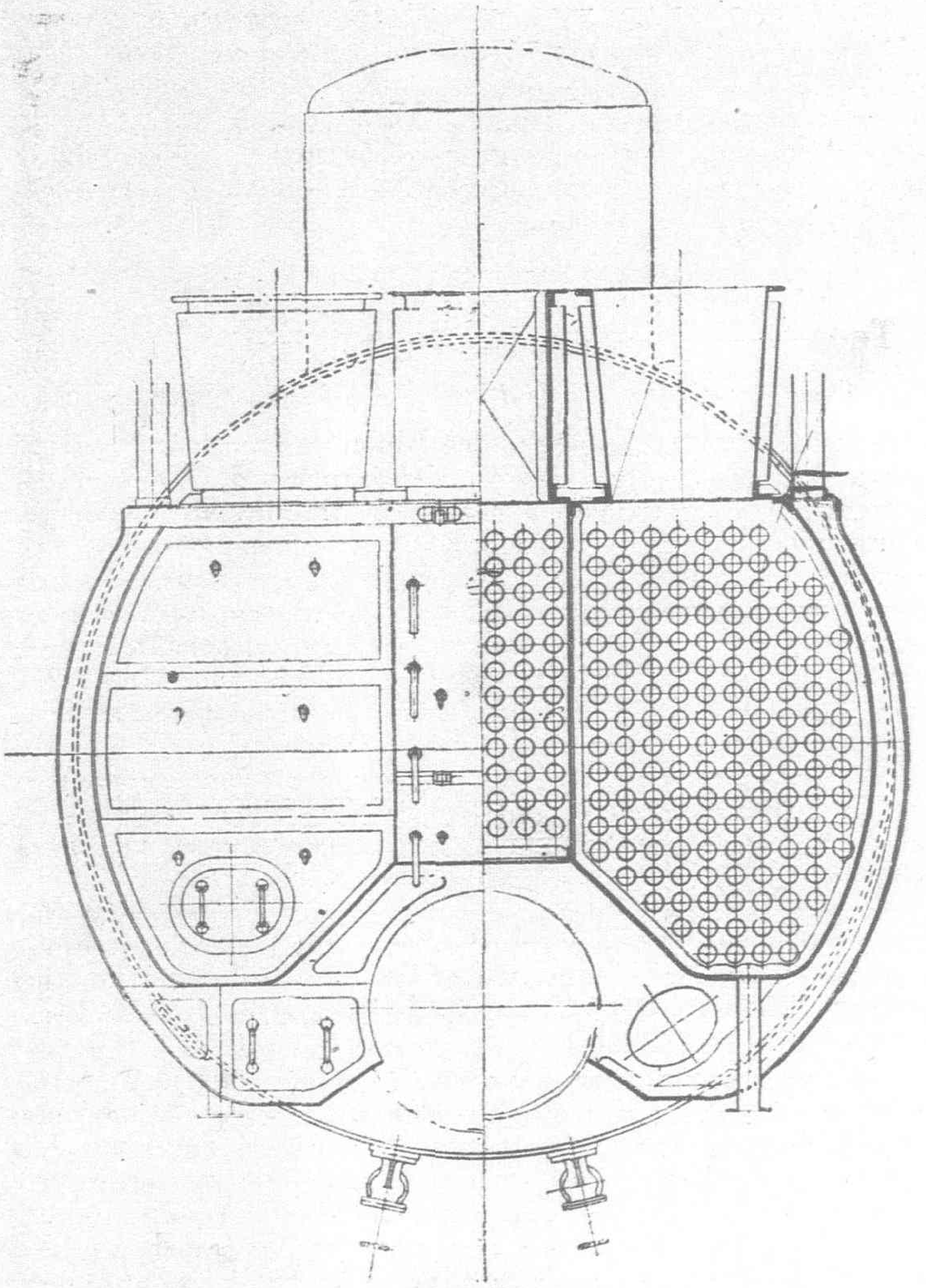
There is a large steam dome, and manholes and mud-holes fitted with doors and compensating rings backed on metal to metal. Further, a spring loaded safety valve with easing gear led to the engine room, separate check valves for the main and donkey feed with internal feed pipe, surface and bottom blow-off valves, two sets of brass water gauges, a salinometer cock and a test cock are provided.

Exhaust gas pipes from the main engines are well lagged, each having a bye-pass pipe with a regulating damper for relieving the exhaust gas up to the main funnel. Smoke boxes of the exhaust gas are fitted at the front and back of the boiler. Draining device is provided to prevent entering of leaky boiler water against working cylinders of the main engines; compensation pipes for expansion being also fitted in the uptake of the boiler and in the bye-pass piping.

The boiler is thoroughly painted and coated with asbestos heat insulating composition and lagged with steel sheets.

In the actual sea trial of the M.S. *Teiyo Maru*, the boiler generated steam at 100 lb. per sq. in. after about 1½ hours.

In accordance with a recent report of the M. S. *Teiyo Maru*, when the vessel was on voyage at a mean draught of 28-ft. 2-in. and with a mean



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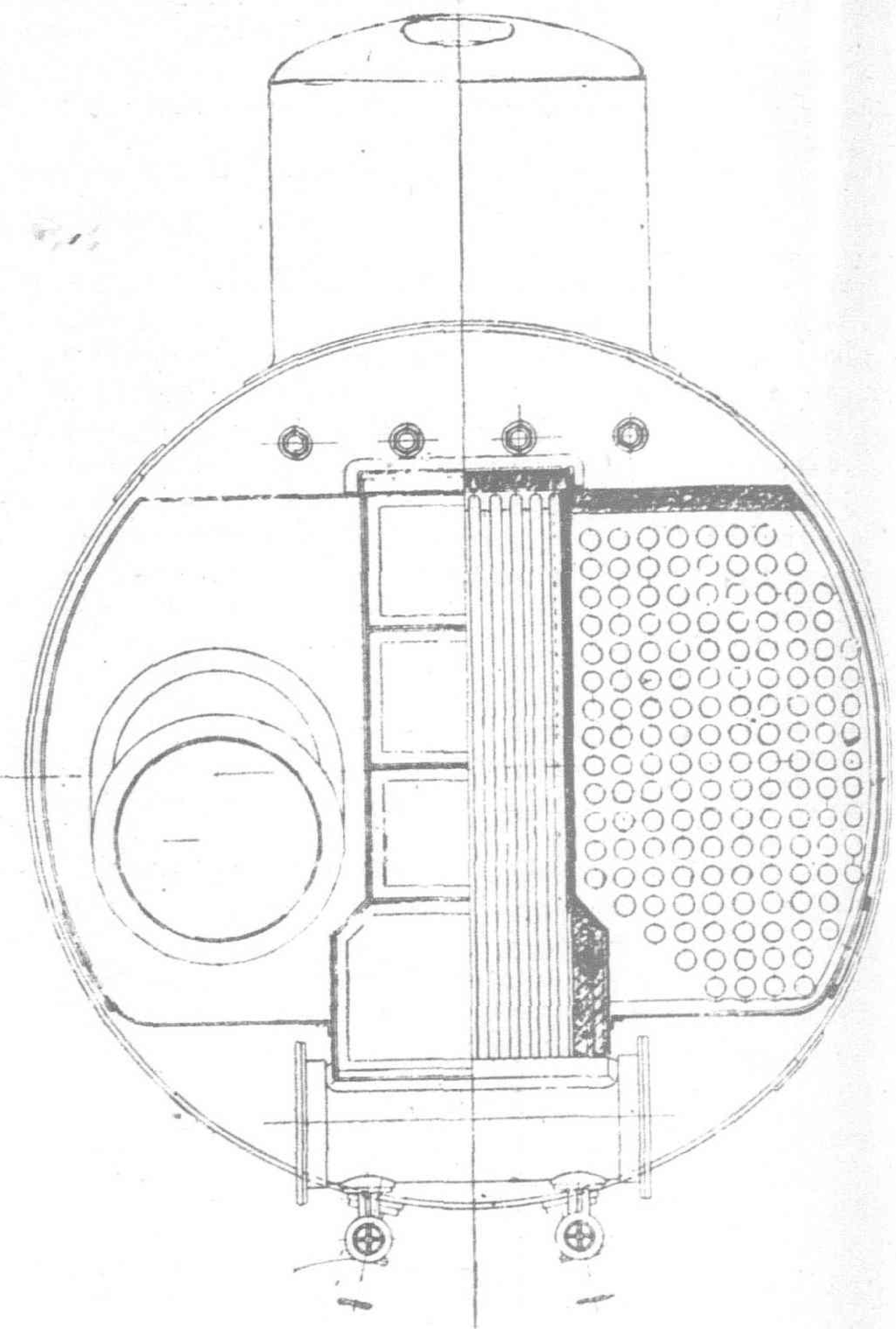
Front of Boiler



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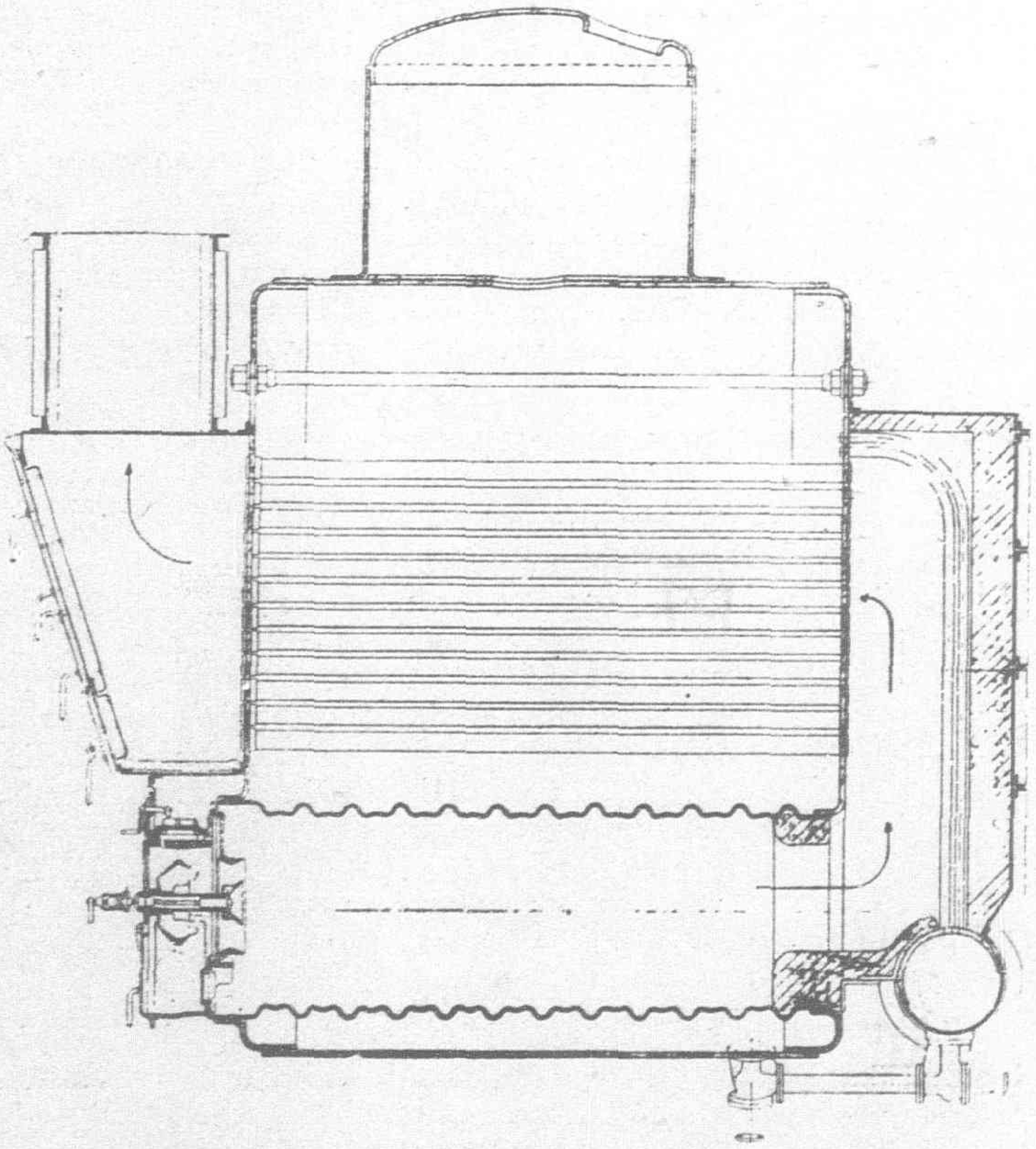
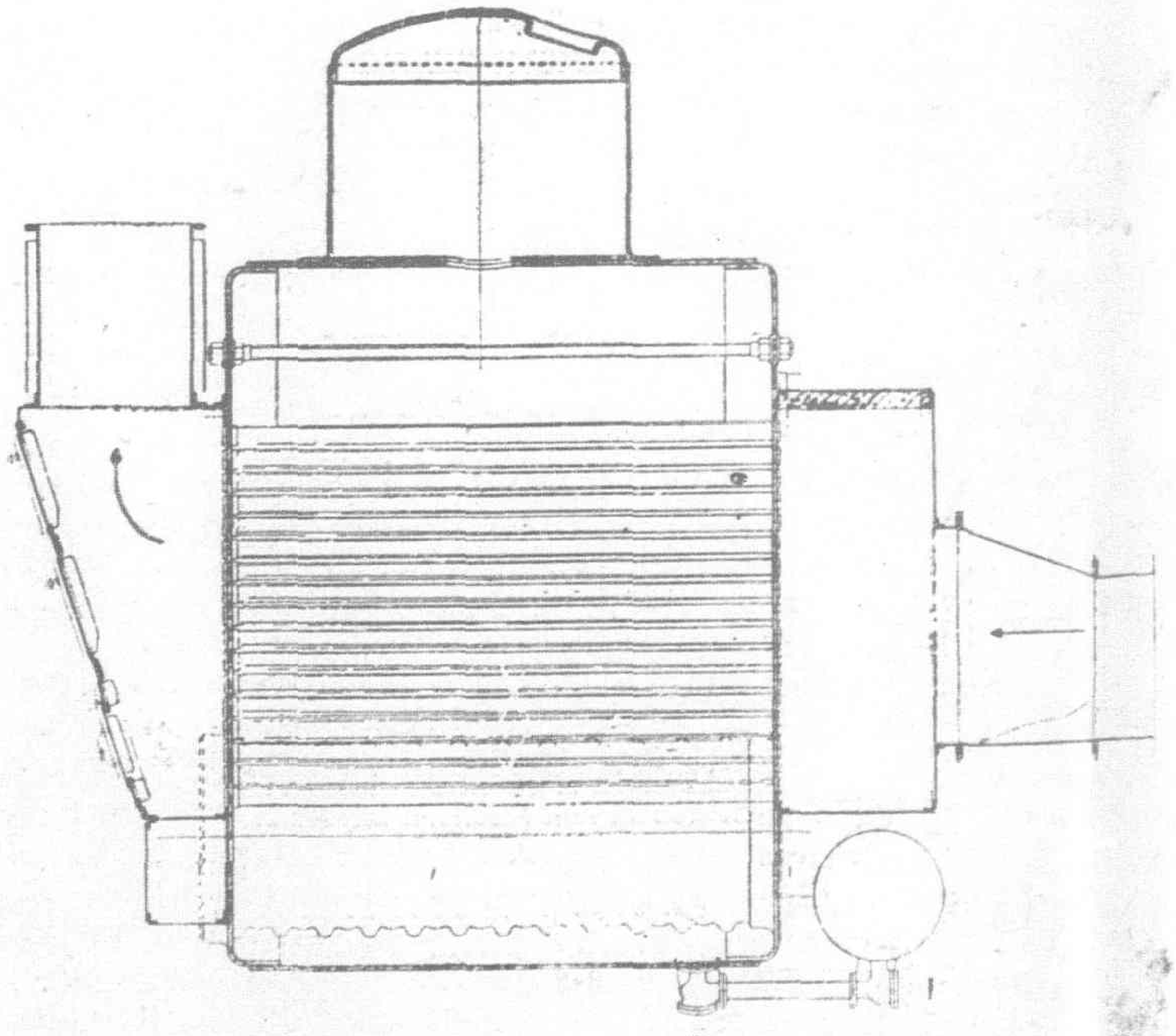
Back of Boiler



重油噴燃部斷面

Section Through Oil Burning Part



排氣通過部斷面

Section Through Exhaust Gas Passage

r.p.m. of the main engine at 120, the combustion gas temperatures of upper and lower cylinders of the main engine were 320 degrees and 220 degrees Centigrade, respectively, *i.e.* 270 deg. C. mean, and the fuel consumption of the combined exhaust gas and oil firing boiler was three tons, whilst the main engine consumed 26 tons of fuel oil. The speed of the vessel having been 14.5 knots and the engine output 6,500 S.H.P., the fuel consumption of the main engine was 167 grams per S.H.P. per hour.

All auxiliary machinery of the *Teiyo Maru* being steam driven, fuel oil of 5-6 tons per 24 hours was generally necessary for the auxiliary boilers when the exhaust gas boiler was not in use, but this rate has been reduced to 3-4 tons by putting the exhaust gas oiler in action. Therefore, a saving of 2-3 tons has been acquired in the fuel oil consumption of the auxiliary boilers ; thus the actual auxiliary fuel consumption has become about the same as that of vessels having Diesel-generators and all electric driven auxiliaries.

The Yokohama Dock Company manufactures the boilers of this type in all sizes suitable to the output of Diesel engines, and has supplied a number of them to oil tankers, passenger and cargo ships, fishing boats, etc.

New Diesel Tug for Rangoon

The steadily increasing use of the Diesel engine for marine propulsion is a matter of frequent comment in connection with such compilations as *Lloyd's Register* returns, as regards large vessels, but the application of this form of prime mover to small ships, such as trawlers, drifters, etc., does not in general receive so much notice. The firm of Petters, Ltd., Yeovil, which has developed its two-stroke heavy oil engine for marine work, has recently supplied a set for a tugboat, operating abroad, which is proving very successful. It has, as a matter of fact, enabled a speed of 1½ knots in excess of the contract figure to be obtained.

This boat is employed on a somewhat unusual service, *viz.*, that of hauling large gasoline floats at Rangoon, and special precautions have therefore been taken to prevent emission of sparks from the engine exhaust. The vessel is 75 feet long, 14 feet beam and 7 feet moulded depth. The main engine is a two-stroke "Atomic" Diesel of 160 h.p. at 330 r.p.m., the propeller drive being direct. There are four cylinders arranged independently on the bedplate, with accessible main bearings between them. Despite this apparent wide spacing, the engine is a compact one, the total overall length including the Mitchell thrust block being only 14 feet, with a total length of 6 feet and a width of 95 feet.

The control wheel, which moves in one direction for all operations, enables the engine to be reversed in about four seconds and also regulates the speed. This prompt reversal and ease of control at any speed is particularly valuable in a vessel such as a tug, which generally requires considerable manoeuvring. The governor control makes continuous operation possible at idling speeds, at any rate down to 25 per cent of normal speed.

Another important contract for Rangoon which has just been completed concerns the building of three lightships at the Saltney yard of J. Chrichton & Co., Ltd., under the supervision of the Gas Accumulator Co. These lightships have been constructed of Armco iron plates for the special purpose of resisting corrosion and are for the use of the Rangoon Harbor Commissioners.

They are being shipped complete on board the Norwegian motor vessel *Belnor* at Liverpool. Each lightship weighs approximately 140 tons with the necessary lifting beams, and their loading on board and carriage by the *Belnor* will add to the already large number of heavy bulk cargoes which have been carried all over the world by the "Bel" motorship fleet.

The lightships are 70 feet long between perpendiculars, 27 feet wide, and 13 feet 6 inches deep. The height of the focal plane is increased to 45 feet above the waterline and the light apparatus is mounted on Aga constant level apparatus with fixed flashing lights of 1,750 candle-power, having a flash of three-quarters of a second and an eclipse period of two seconds. There are also riding lights fore and aft, the lanterns being fitted with 10-litre burners set to 40 flashes per minute. The main light, the riding lights fore and aft, and the carbonic acid fogbell all operate automatically for one year without attention, and the light and fogbell are under sun-valve control. This is sensitive even to the passing of a heavy cloud. In addition to this automatic equipment, there is an ordinary 10 cwt. bell gong mounted on deck. The light and bell mechanism was partly dismantled for the voyage, and when the *Belnor* reaches her destination the mechanism will be reassembled by the representatives of the Gas Accumulator Co. This will take several days. It is interesting to note that a previous lightship, which was the first to be carried in a completed condition, was unloaded and ready on its station three days after arrival at the port of discharge.

Telephone Systems in French Indo-China

Vice-Consul W. EVERETT SCOTTEN, Saigon

Each of the five countries in the Union of French Indo-China possesses a "Service des Postes, Télégraphes, et Téléphones" constituting a Government monopoly of the postal, telegraph, and telephone systems, administered by a "Sous Directeur," or subordinate manager placed under the authority of the chief executive officer of the country. In turn, these local organizations are grouped for administrative purposes into a general service controlled by the "Directeur des Postes, Télégraphes, et Téléphones" at Hanoi, as a department of the colonial government responsible to the Governor General.

The personnel consists of a group of superior officials, detached from the administrative organization of the French Ministry of Posts, Telegraphs, and Telephones and recruited from the local administration, and of native employees.

The receipts and expenditures of the service throughout the country form part of the general budget, which invariably shows a considerable deficit for this department, due apparently to the fact that a large number of unprofitable installations have been made for the benefit and development of the country, to the cost of certain postal lines over which mail must be carried by automobile, and to the length and high maintenance costs of the lines in proportion to the traffic carried and the return therefrom.

Subscriptions are divided into two classes : First, the strictly private installations which only the subscriber and his family, guests, employees, or business associates are expected to use ; second, those placed at the disposition of the public, as in hotels, restaurants, etc. For the first class the yearly rate is 60 piasters in the cities of Hanoi, Haiphong, and Saigon-Cholon, and 50 piasters in other exchanges. For the second the rate is 85 piasters in the cities mentioned, and 75 piasters elsewhere. Extensions cost 20 piasters each up to 10 from the same regular installation, 15 piasters each for a number between 10 and 50, 10 piasters each for a number between 50 and 200, and five piasters each for any number above 200. (One piaster=approximately $0.392.)

The equipment provided all over Indo-China is uniformly an obsolete and usually badly worn magneto type. The installation of an automatic system in Saigon is proposed, but as yet there is no indication as to when this project can be expected to materialize.

The following table shows the length of lines, number of subscribers, number of calls, and amount of charges over a period of years :—

Year	Length of lines on Dec. 31 (kilometers)			Subscribers (number)	Calls (number)	Charges (piastres)*
	Aerial	Under-ground	Length of wires			
1913 ..	456	93	3,685	810	343,000	42,000
1922 ..	1,515	660	7,085	2,523	954,000	131,000
1923 ..	2,266	237	12,318	2,945	2,028,000	160,000
1924 ..	2,793	383	16,739	3,361	3,049,000	200,000
1925 ..	3,267	434	20,472	4,269	3,380,000	252,000
1926 ..	3,829	554	24,832	5,118	4,019,000	362,000
1927 ..	3,788	566	27,650	5,443	5,301,000	391,000
1928 ..	3,911	621	28,651	6,106	8,585,000	453,000
1929 ..	4,352	784	31,774	6,929	9,550,000	488,000

* One piastre equals approximately $0.392.

Radiotelephone Service

Since April, 1930, there has been maintained a radio-telephonic service from Saigon-Cholon and from Pnom Penh to France, Germany, Austria, Belgium, Great Britain, Hungary, Luxembourg, Netherlands, Sweden, Switzerland, and Czechoslovakia, through the medium of a large transmitting station at Saigon on a powerful long-wage length, with the alternative of a short wave for distance work.

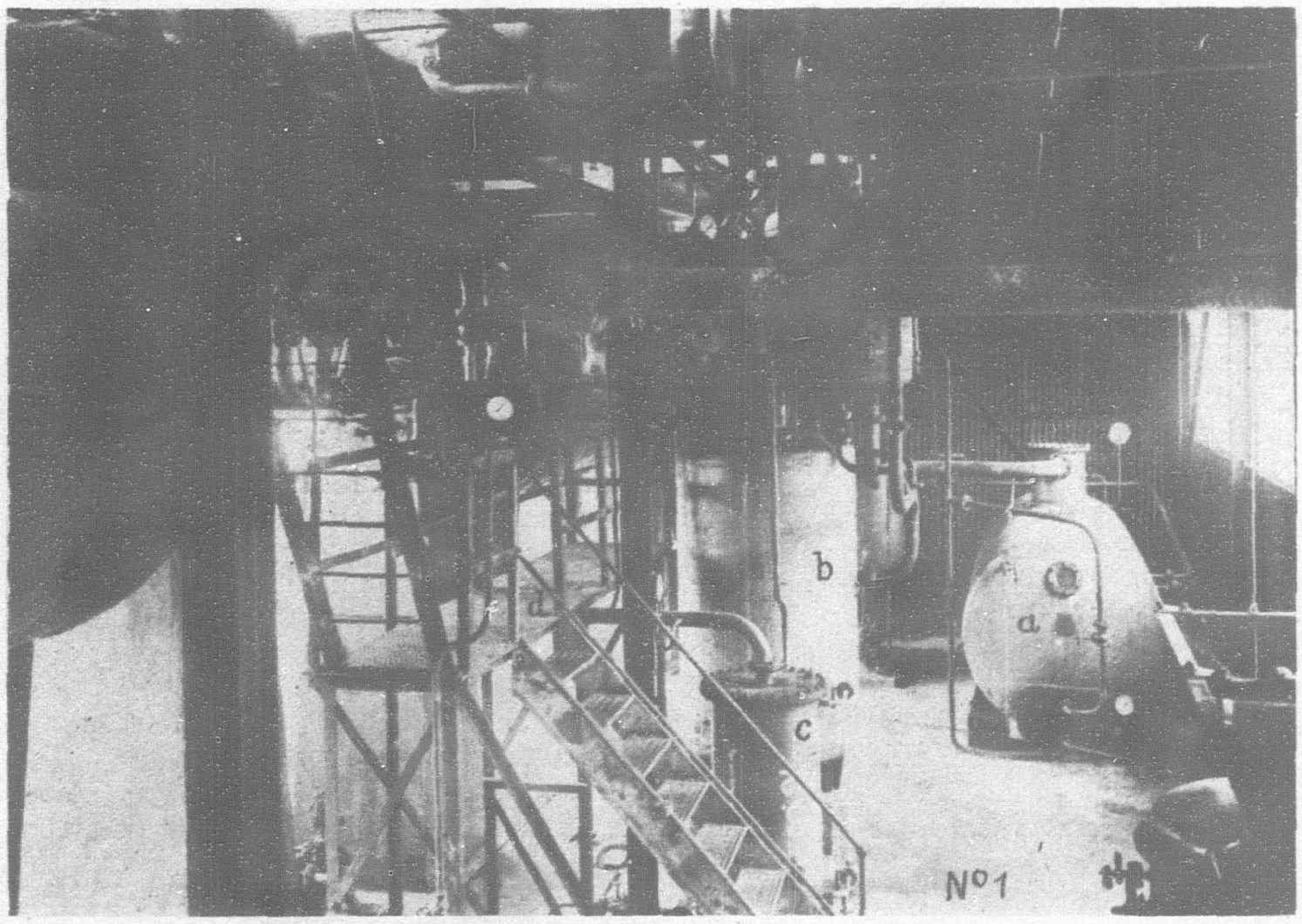
Modern Process and Equipment for the Solvent Extraction of Vegetable Oils

According to present-day practice oil is extracted from oil-bearing seeds and fruits mainly by means of presses which force the oil out of the ground seeds under high pressure. In more recent times, however, the most up-to-date oil mills have begun turning to extraction plants, in which volatile solvents, as for instance benzine, are used for recovering the oil from fruits or seeds which have previously been broken up.

The press process is the oldest method of oil manufacture, but it requires a number of expensive machines, as well as a great deal of power and manual labor. Moreover, presses extract only a small proportion of the oil contained in seeds and fruits though they work at pressures up to 300 atmospheres (4,267 lbs. per square inch) and more. Last but not least, wear and tear of machinery in press plants and cost for renewal of press cloths are considerable.

The solvent extraction process offers the great advantage of recovering practically all oil from the seeds and fruits except an insignificant residue remaining in the residuary meal, and it does this work in a very simple and inexpensive way. The solvent extraction process does away with those heavy and costly machines with enormous power consumption which are found in press plants, and it needs but a simple apparatus, for which the initial expenditure and operating cost are substantially below those of a press equipment, while the proportion of the oil recovered is much higher.

Unfortunately a great many of the upright or vertical solvent extractors which are in the market have a number of deficiencies. In many cases the degreased meal has a perceptible odor of the solvents due to the meal having clotted together during the extraction process, insufficient mixing and stirring of the material and the lack of vacuum during the steaming period when the solvents are to be driven out of the degreased meal. The damp meal coming from such extractors often has to undergo a second drying operation in a separate dryer. The oil solutions coming from these upright extractors have to be filtered in separate apparatus, and are more or less troubled by albumins and undesirable mucous substances which are generally known to act unfavorably on the odor, taste and color of the oil because they decompose partly.



Extraction plant installed by Messrs. A. G.-Basel, Switzerland for Messrs. Edward Gorton Ltd., Warrington, England, showing Ground Floor, (a) Horizontal Still for separating Solvent from Mixture of Solvent and Fat, (b) Water Separator, (c) Solvent Evaporator, (d) Attendance Platform, (e) Rotating Extractor with Insulation (f) Condensate Collector

To avoid these shortcomings rotating extractors of various designs have been conceived to combine in one uninterrupted succession of operations the work of extraction, steaming, intimate mixing under vacuum and drying without the use of a special drying apparatus.

However, the oil solutions obtained in these rotating extractors must also be treated in separate filters and the oils are not superior in quality to those recovered in the vertical extractors previously referred to because the partial decomposition of the albumins and mucous substances carried by the oil-bearing solvent is not eliminated. The type of rotating extractors described hereafter forms an exception to this general rule. All rotating extractors which we know of have only little advantages over the upright ones, but as a rule they have the disadvantage of producing oil solutions of feeble concentration which results in larger losses of solvent and increased consumption of steam, power and cooling water. However, the main drawback of all rotating extractors is that they can only be filled with meal to 50 or 60 per cent of their capacity and that there is no possibility of arranging a number of them in series.

Investigators have endeavored to overcome these deficiencies of the rotating extractors by creating a new extraction process and a novel type of revolving extractor, which have already given excellent results in several oil mills in Europe and the U.S.A. The "Buss" Process stands in a class by itself among the numerous solvent extraction methods for the reason that it couples the advantages of the upright extractors, single or arranged in series with the good features characteristic of the rotating type. We may, therefore, say that the "Buss" Rotating Extractors do fulfill the most exacting requirements of modern oil making technics. They embody the following advantages:—

Similar to the vertical type extractors, the "Buss" Revolving Extractors can be filled with broken up seeds and fruits nearly to their entire capacity and favorably contrast in this respect with other rotating apparatus. At the same time several extractors can be coupled to work in series.

The "Buss" Extraction Process eliminates the expensive apparatus for the second drying operation and produces in one continuous sequence of operations a degreased meal which is dry and free from the taste and odor of the solvents used. As a matter of fact, the meal is ready for being filled into sacks and sold as cattle food when it is discharged automatically while the extractor revolves.

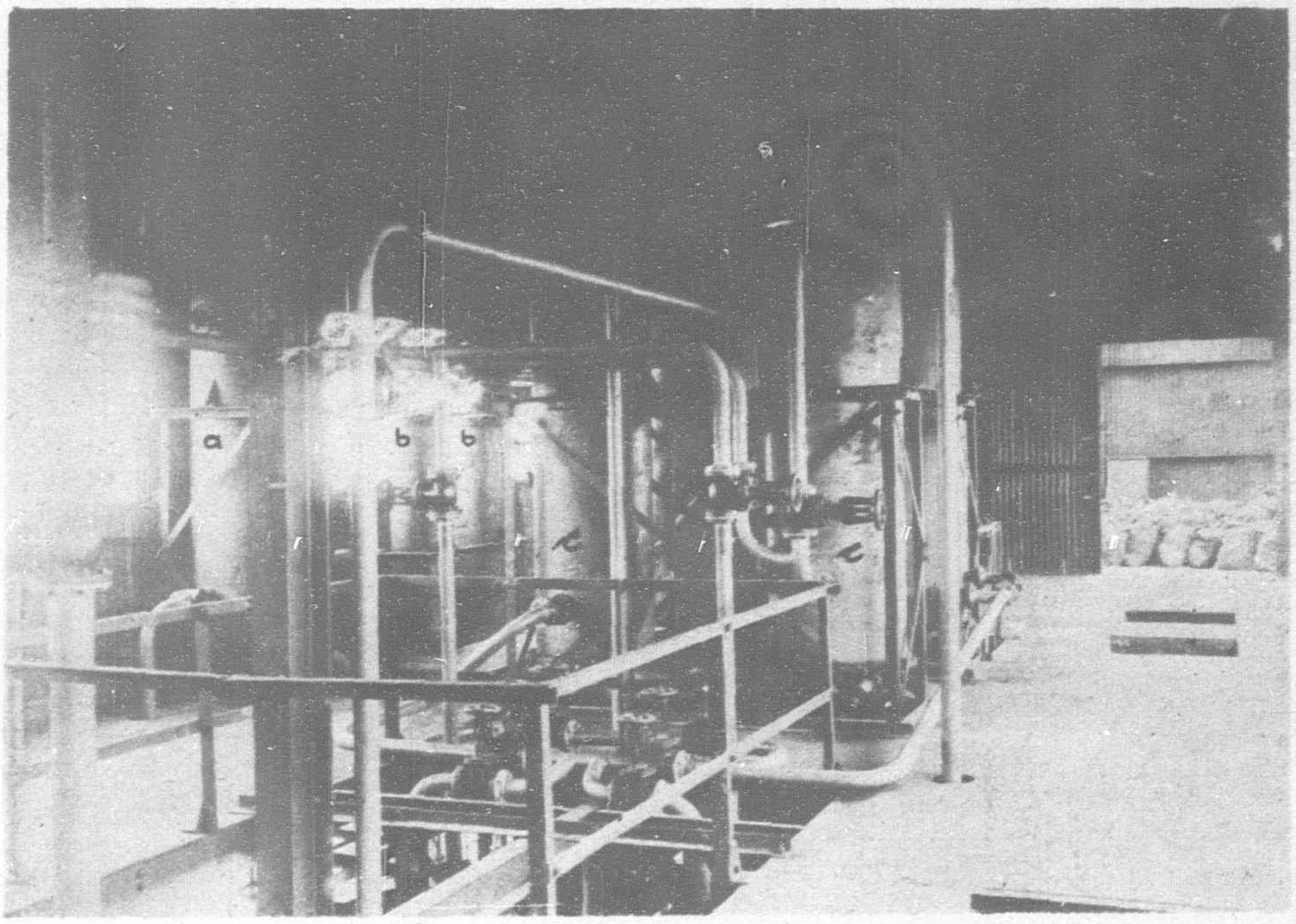
The oil-bearing solutions obtained with the process and extractor are the most concentrated ones and they leave the extractor as a bright and clear liquid containing nearly no albuminates or mucous and bitter substances at all. Concentrated oil solutions are all-important for reducing the solvent loss, as well as consumption of power, steam and cooling water to the strict minimum. While other extractors have to be followed by a filter, this apparatus is dispensed with in the "Buss" system, the oil-bearing solution being filtered in the interior of the extractor and the oil solutions are without a trace of turbidness and give bright and clear oils with lowest acid content after the usual treatment.

As a rule benzine is preferred as solvent, though the "Buss" Extractors also work with other solvents such as benzol, carbonic disulphide, trichlorethylene, trichloride of carbon, etc.

The "Buss" Rotating Extractors are built in three standard sizes of 880, 1,650 and 2,640 Imp. Gallons

(1,060, 1,980 and 3,170 U.S. Gallons) capacity. It is another exclusive feature of the extractors which will be found in no other revolving apparatus that a number of them can be interlinked to work in series on the enrichment method. This method is unexcelled for its efficiency for the following reasons :—

The output of 4 to 8 "Buss" Revolving Extractors arranged in a battery exceeds that of individual unit extractors of equal size by about 25 per cent. The most concentrated oil solutions are produced. This makes it possible to reduce the quantity of solvent circulating in the system which results in a reduction of the solvent loss, saving of steam and saving of cooling water. Lower power consumption, there being less time when the shaftings run without load. Large saving in labor cost because less attendants required, the plant being easy to supervise and easy to operate. The percentage of oil remaining in the residuary meal is reduced.


Another view of First Floor of Warrington Plant, (a) Safety Condenser, (b) Absorption Tubes of Solvent Recovery Plant (c) Condensers.

For 1 or 2 "Buss" Extractors the solvent loss averages from 0.9 to 1.25 per cent if the solvent recovery apparatus is run with water, or 0.8 to 1 per cent if the said apparatus works with oil, the oil content of the residuary meal being 1 to 1.5 per cent. Plants with one or two Extractors consume per ton of 2,240 lbs. oil-bearing seeds or fruits treated about 1,650 to 2,200 lbs. steam, 5 to 6 kwh power (for the extraction plant proper exclusive of grinding machinery and conveyors), about 3,960 to 4,620 Imp. Gallons (4,760 to 5,550 U.S. Gallons or 18 to 21 cubic meters) cooling water of 59 degrees F. initial temperature if the solvent recovery apparatus works with water, or 3,080 to 3,740 Imp. Gallons (3,700 to 4,490 U.S. Gallons or 14 to 17 cubic meters) cooling water if the solvent recovery equipment runs with oil. The labor cost for attending to an extraction plant with 1 "Buss" Extractor is estimated at 4 to 5 working hours per ton of 2,240 lbs. seeds and 2 to 2.5 working hours if the plant is equipped with 2 "Buss" Extractors. In either case two men per shift can operate the plant.

All solvent extraction plants offered can be enlarged at any time by increasing the number of Extractors and arranging the latter to work in series.

When treating the same kind of oil-bearing seeds or fruits in a battery of 4 to 5 Extractors, the solvent loss is reduced from 0.9—1.25 per cent to 0.8—1.1 per cent, or from 0.8—1 per cent to 0.7—0.9 per cent respectively, while the oil content in the degreased meal drops from 1—1.5 per cent to 0.8—1 per cent.

For each ton of 2,240 lbs. seeds or fruits dealt with in a battery of 4 to 5 Rotating Extractors steam consumption is 1,430 to 1,765 lbs., power consumption 4 to 5 kwh for the extraction process alone (*i.e.* exclusive of hulling, grinding and conveying) and consumption of cooling water with 59 degrees F. initial temperature is about 3,080 to 3,740 Imp. Gallons (3,700 to 4,490 U.S. Gallons or 14 to 17 cubic meters) if the solvent recovery plant works with water, and from 2,240 to 2,860 Imp. Gallons (2,900 to 3,430 U.S. Gallons or 11 to 13 cubic meters) if with oil. About 1.5 to 2.5 working hours can be reckoned with for degreasing one ton of 2,240 lbs. seeds or fruits and three men per shift will be sufficient for this service.

The efficiency of the entire plan still can be increased and further savings effected by coupling five to eight Extractors in series.

When it is desired to have a small capacity plant work with maximum efficiency, batteries of extractors with 1,650 or 880 Imp. Gallons (1,980 or 1,060 U.S. Gallons) individual capacity instead of one or several large size extractors holding 2,640 Imp. Gallons (3,170 U.S. Gallons) are supplied.

Japanese Electrical Imports and Exports

Below are given the values of Japan's imports and exports of electrical and allied goods last year, as stated in the recently-issued returns of that country's foreign trade. The comparative figures for the previous year are also given, together with notes of increases or decreases.

It will be noticed that imports of electrical machinery are still larger than exports, although the former declined severely last year and the latter rose slightly. Imports of all electrical material fell last year. (9.85 yen=£1.)

IMPORTS

	1929 Thous. yen.	*1930 Thous. yen.*	*Inc. or dec. Thous. yen.*
Submarine telegraphic and telephonic cables	1,686	260	—1,426
Other insulated wire	257	168	— 89
Wattmeters	908	368	— 540
Ammeters and voltmeters	329	216	— 113
Batteries	422	260	— 162
Telegraph instruments	930	530	— 400
Telephonic instruments, total	2,890	1,303	—1,587
Including :—Radio sets	570	320	— 250
Steam turbines	825	1,025	+ 200
Water turbines and Pelton wheels ...	1,095	36	—1,059
Dynamos and motors, total	6,830	3,540	—3,290
Including :—			
Weighing not more than 100 kg. ...	1,926	1,490	— 436
Between 100 and 500 kg.	1,600	660	— 940
Transformers	650	350	— 300
Dynamos combined with motive machinery	1,325	1,200	— 125

EXPORTS

	1929 Thous. yen.	*1930 Thous. yen.*	*Inc. or dec. Thous. yen.*
Insulated electric wire	3,530	3,630	+ 100
Electrical machinery and parts	2,450	3,000	+ 550
Telephones and parts	920	600	— 320
Electric lamps	5,400	5,320	— 80

Engineering Notes

INDUSTRIAL

POWER PLANT AT ICHANG.—The Chinese Ministry of Industry announces that a fifty million dollar water power project near Ichang is to be constructed within three years. Mr. Chen Kung-po, the Minister has already authorized the construction of a 40,000 kilowatt hydro-electric power plant at Ichang as part of the five-year industrial plan for the development of the Yangtze valley. According to experts the flow of water in the Ichang gorge was recorded as 800,000 cubic feet a second last October and he estimates that horse power to the total of 22,000,000 can be developed there. The 40,000 kilowatt station at Ichang will first be constructed, utilizing 56,000 horse power of what is available there.

CAN MAKING PLANT.—With the object of developing the tin can-making trade in South China, the newly established China Can Company Limited, officially has opened their new factory at No. 2, Davis Street, Kennedy Town. The factory is a large establishment wherein special attention has been paid to the welfare of those employed. In time it is anticipated that a school and hospital for the benefit of the workers will be founded. Throughout, the machinery is of modern type and is capable of a very large output. The factory will turn out containers of all sorts, also signboards, crown corks, toys, tin novelties, etc.

NEW CHINESE GUNBOATS.—The Chinese Ministry of the Navy announces that two new gunboats, *Kiangning* and *Haining*, are due to be completed at the Kiangnan Dock next June, while work on a third began a few weeks ago. The three gunboats are identical in construction and armaments, being each 128 feet long, 28 feet wide, with a tonnage of 300 tons and a draft of six feet. They will have a speed of 11 knots. Besides being armed with two 3-inch guns and four machine-guns, they will also be equipped with short-wave and long-wave wireless apparatus. The cost is Tls. 150,000 for each boat.—*Kus Min.*

RAILWAYS

BUYS EQUIPMENT.—Dr. C. Wang, director of the Chinese Purchasing Commission, whose business it is to lay out £3,000,000 of the British Boxer Indemnity on the purchase of railway and engineering material in this country, has just returned to London from his mission in Italy. In conversation with *Reuter's* diplomatic correspondent, Dr. Wang said that the work of the London Commission was progressing splendidly. A considerable amount of railway and electrical material had been purchased, the exact quantity being difficult to appraise, as there were so many outstanding orders. A steady stream of orders was being received from China, and these were being smoothly executed with all possible speed, and all the material required was being obtained from British engineering and manufacturing firms.

TO COMPLETE SECTION.—Early completion of the Tihua-Hsinghsinghsia section of the Kansu-Sinkiang National Highway is ordered by the Ministry of Railways, in a telegram to the Sinkiang Provincial authorities. The Tihua-Hsinghsinghsia section covers a distance of about 315 miles, part of which, running from Tihua to Hami, has already been completed. Only 115 miles of highway in Sinkiang extending from Hami to Hsinghsinghsia (Gorilla Pass), on the Sinkiang-Kansu border, need be constructed to finish the section.—*Kuo Min.*

LONG RAILS IN JAPAN.—The Yawata works are negotiating with the Imperial Government railways for rolling 37-kg (74-lb.) rails 24 m. (about 80-ft.) long as an experiment to be tried on the railways in Japan.

AVIATION

HANEDA AIRPORT.—The Japanese Aviation Bureau will celebrate with an elaborate ceremony the completion of the Tokyo International Airport here early in April. Although the Airport was opened for international flyers' take-offs and landings last August, most of the equipment had yet to be built. The *Tokyo Nichi Nichi* plane sheds which had been under construction in one corner of the flying field were recently completed, while the Japan Air Transport Company's hangar and business offices are steadily nearing completion, the workers having removed the scaffolding recently. The completion late in March of the sheds for the Japan Aviation School's land and sea craft will mark the end of the construction work on the Airport premises.

CHINESE AIRPLANE PLANT.—A new plant is being built by the Chinese Ministry of Navy for the construction of airplanes near the existing plant in Shanghai, according to the head of the bureau of airplane construction in the Ministry of Navy. It is of 121 feet deep and 50 feet wide. The main floor will be devoted to assembling and manufacturing. It is scheduled to be completed by the end of June. Plans for six airplanes of 220 horse-power each are being laid out. They are to be completed by the end of this year. Besides these six planes, two fighting crafts are being considered. Work on these two will start early next year.

BERLIN-SHANGHAI AIR LINE.—Some time in 1932 the long-projected Berlin-Shanghai air line will become an accomplished fact, according to aviation circles in Berlin. The line will operate in three sections, Berlin-Moscow, Moscow to the Sino-Soviet frontier and from the border to Shanghai.—*Havas.*

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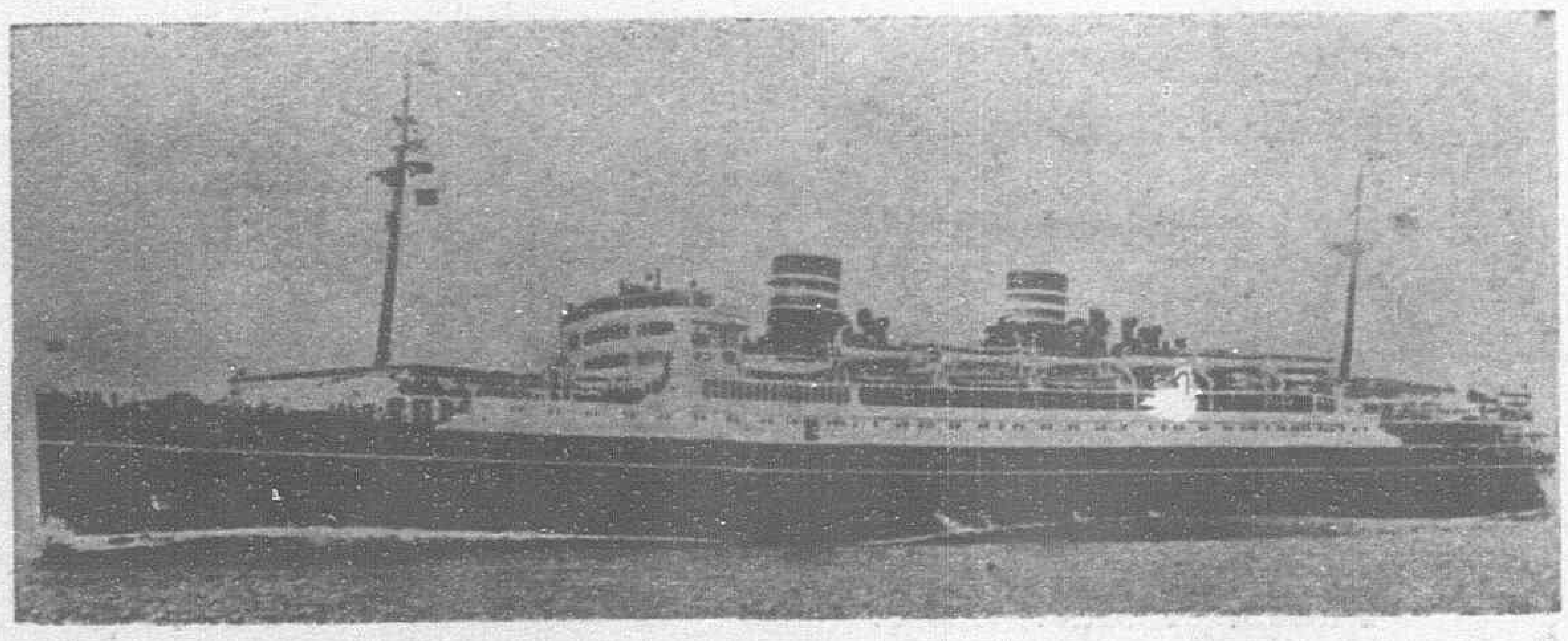

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